A CLINICAL STUDY ON INCISIONAL HERNIA

Dissertation submitted to

THE TAMIL NADU DR. MGR. MEDICAL UNIVERSITY

CHENNAI – 600 032

In partial fulfilment of the regulations

For the awards of the degree of

M.S. DEGREE BRANCH – I

GENERAL SURGERY

GOVERNMENT MOHAN KUMARAMANGALAM

MEDICAL COLLEGE, SALEM

APRIL 2014

CERTIFICATE BY THE GUIDE

This is to certify that this dissertation entitled "**A CLINICAL STUDY ON INCISIONAL HERNIA IN GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE, SALEM**" is a bonafide work done by **DR. ANBU. A,** under my guidance during the period of 2011-2013. This has been submitted to the partial fulfilment of the award of M.S. degree in General Surgery (Branch I) Tamil Nadu Dr. M.G.R. Medical University, Chennai-32.

PROF. DR. C. RAJASEKARAN, M.S.
Professor of General Surgery
Govt. Mohan Kumaramangalam Medical College, Salem.

PROF. DR. R. KATTABOMMAN, M.S.
Professor & HOD of General Surgery
Govt. Mohan Kumaramangalam Medical College, Salem.

Professor and Head of the Department
Department of the Surgery.
Govt. M. K. Medical College.
SALEM.

20/12/13

DEAN
Govt.Mohan Kumaramangalam
Medical College Hospital,
Salem - 636 001.

DEAN
Govt. Mohan Kumaramangalam Medical College,
Salem.

DECLARATION

I solemnly declare that this dissertation "**A CLINICAL STUDY ON INCISIONAL HERNIA**" was prepared by me at Government Mohan Kumaramangalam Medical College and Hospital, Salem - 636030 under the guidance and supervision of **Prof. Dr.C.RAJASEKARAN, M.S.**, Professor of General Surgery, Govt. Mohan Kumaramangalam Medical College and Hospital, Salem. This dissertation is submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in fulfilment of the University regulations for the award of the degree of M.S. General Surgery (Branch I).

Place: Salem

Date: 26.12.2011

DR. ANBU. A.

ACKNOWLEDGEMENT

I am extremely thankful to **Prof. Dr.A. KARTHIKEYAN, M.D.,** Dean, Govt. Mohan Kumaramangalam Medical College and Hospital, for allowing me to utilize the hospital facilities for doing this work.

I am also thankful to **Prof. Dr. T. SWAMINATHAN, M.S,** Medical Superintendent, Govt. Mohan Kumaramangalam Medical College and Hospital, for his whole hearted support and encouragement for the completion of this dissertation.

I express deep thanks to **Prof. Dr. R. KATTABOMMAN. M.S.,** Head of the Department of Surgery, for his esteemed guidance and valuable suggestions from the very beginning of this study.

I express my deep sense of gratitude and indebtedness to my unit chief **Prof. Dr. C. RAJASEKARAN, M.S** for giving me inspiration, valuable guidance and his unstinting help in completing the course and preparing this dissertation.

I thank all surgical unit chiefs **Prof. Dr.** P. RAMALINGAM, M.S, **Prof. Dr.** K.SANTHI, M.S, **Prof. Dr.** A.NIRMALA, M.S., **Prof. Dr.** V.LAKSHMI NARAYANI, M.S for their advice and kind help.

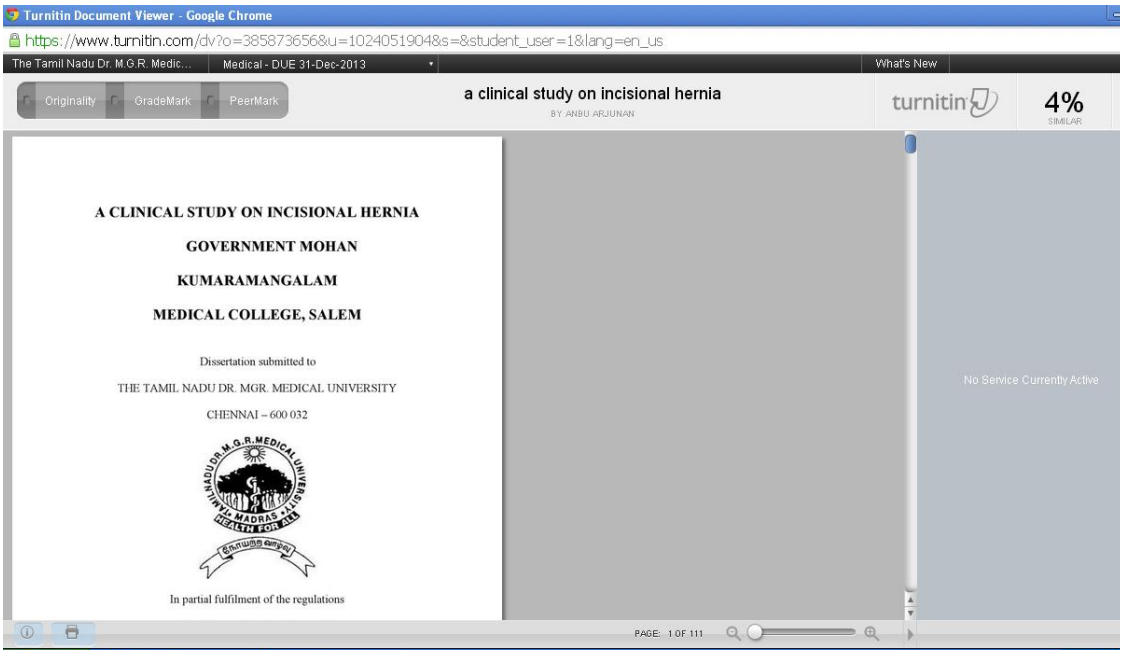
It is my privileged duty to profusely thank my assistant professors Dr.R.SWAMINATHAN,M.S. Dr.N. JEEVA, M.S. Dr. V.SIVAKUMAR, M.S, who helped and guided me in many aspects of this study.

I sincerely thank The Professor and Assistant Professors in the Department of General Surgery for their encouragement and guidance in various aspects of this study.

I take this opportunity to thank all my Post Graduate colleagues and friends who helped me a lot in completing this dissertation successfully.

I cordially thank my parents and AnuSelvaraj(sister), Suresh, Jayaprakash, Sivaskumar, Firdhose who have always been there with me whenever I needed their help and cooperation.

I am deeply obliged to my patients, without whose help the present study would not have been possible.


Turnitin Document Viewer - Google Chrome
https://www.turnitin.com/dv?o=385873656&u=1024051904&s=&student_user=1&lang=en_us
The Tamil Nadu Dr. M.G.R. Medic...
Medical - DUE 31-Dec-2013
What's New
Originality
GradeMark
PeerMark
a clinical study on incisional hernia
BY ANBU ARJUNAN
turnitin
4%
SIMILAR
A CLINICAL STUDY ON INCISIONAL HERNIA
GOVERNMENT MOHAN
KUMARAMANGALAM
MEDICAL COLLEGE, SALEM
Dissertation submitted to
THE TAMIL NADU DR. MGR. MEDICAL UNIVERSITY
CHENNAI – 600 032
In partial fulfilment of the regulations
No Service Currently Active
PAGE: 1 OF 111

ABSTRACT

Incisional hernia is a hernia arising from previous surgical or wound site. Incisional hernia constitutes 2% – 12 % of all abdominal surgical incisions. There are many surgical techniques are available but no one is best always.

AIM & OBJECTIVE

To evaluate the incidence of incisional hernia and to compare the various surgical techniques to repair the incisional hernia.

MATERIALS & METHODS

This prospective study of 60 consecutive cases of incisional hernia admitted in Government Mohan Kumaramangalam Medical College Hospital, Salem was done in the period from July 2011 to June 2013. The cases were evaluated through proper history taking, clinical examination, operative procedure and post operative follow-ups.

OBSERVATION

In our study, commonest age group having incisional hernia is between 30 – 50 years (46.6%). Females are common (61.7%), the most

common previous surgery to develop the incisional hernia is Laparotomy(58.3%) and common surgical incision is Median Vertical(45.1%). Most of the patients (27.3%) had wound dehiscence. 47% of patient had incisional hernia within one year of previous surgery. In this study, I found 10% of recurrence rate, 25% of per operative bleeding and 25% of chronic pain for onlay mesh repair. Sublay, Component Separation Techinique and Laparoscopic technique had no recurrence; Chronic pain was noticed 10% patients in Component Separation and Laparoscopic techniques while only 5% patients in Sublay repair.Hospital stay is less required in sublay repairs and laparoscopic repairs. Sublay technique had less post operative complication.

CONCLUSION

Open Sublay mesh repair and Laparoscopic mesh repair are the best method in our study compared to others. Middle aged female patients who underwent laparotomy with wound dehiscence having midline vertical incision had incisional hernia commonly.

KEY WORDS

Incisional Hernia, Mesh repair, Onlay, Sublay, Component Separation, Laparoscopy,

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF CHART

LIST OF ABBREVIATIONS USED

Yrs-years

No of-number of

CT-computerized tomography

MRI-magnetic resonant imaging

DOA-date of admission

DOD-date of discharge

DOS-date of surgery

DM-diabetes mellitus

RR-respiratory rate

BP-blood pressure

P/R-per rectal

P/V-per vaginal

Hb-haemoglobin

ECG-electrocardiogram

USG-ultra sonogram

SA-spinal anesthesia

GA-general anesthesia

INTRODUCTION

"No disease of the human body belonging to the province of the Surgeon requires in its treatment a better combination of accurate anatomical knowledge with surgical skill than Hernia in all it's varieties"-Sir AstelyPastonCopper(1804).

Abdominal wall hernias are very popular in general surgery. Many people are affected by this problem. Some of them are symptomatic and others are asymptomatic. It may be congenital problem or acquired. Hernia presentations are commonly inguinal, ventral and incisional hernia. Most of the patients undergoing surgery for this problem because of incarceration or obstruction may occurs at any time.

"Hernia is derived from Latin word – meaning as 'Rupture[1]'. In Greek work HERNIAS/ KELE meaning is bud / off shoot[2]."

"Hernia is defined as abnormal protrusion of whole or part of viscus through the walls that contains it."

Hernia continuously enlarges in size because of increased intra abdominal pressure which is the greatest part of the hernia formation. The Pascal's principle and the law of LaPlace can explain it.

Incisional hernia is defined as hernia developing in the previous surgical scar or trauma. Various techniques are available for incisional hernia repair. Each technique has its own merits and demerits. Recurrence is common depends on technical error, patient's error and due to materials.

The key concept for hernia repair is tension free repair. Now a days mesh is used for fascial defect closure without tension. The anatomical repair, Ramirez's component separation is technique is available for infected wound, large hernia and multiple defects with tension free repair.

In this study, I have analyzed various techniques available to repair the incisional hernia and I have found out the incidence of various etiological factors to cause the incisional hernia among the 60 patients admitted in our hospital during the period of July 2011 to June 2013.

HISTORY

"History of hernia repair is the history of surgery" - stated by Nyhus[3].

- Manuscripts referring hernia were found in Egyptian and Mesopotamian cultures[4].
- Around 1550 BC, famous PapyrusEbers quoted hernia and treatment as[2,4]

  'Then you shall say concerning it "This is a swelling of the coverings of his abdomen, an illness which I will treat". It is the heat of his bladder in front of his belly, which creates it. Falling to the ground, it returns likewise. You should heat ("shemen") it to imprison it in his belly. You treat it like the "sahemen" treatment'
- "Old masters" of Greek and roman antiquity- elaborated origin, pathology, symptoms and treatment of hernia.
- Hippocratic Corpus stated hernia resulted from drinking water from large river or experiencing traumatic events to belly and described hernia as 'tear in the abdomen'[2,6].

- Erasistratus of Keos – considered as “the father of physiology” performed hernia surgery in Egypt[5].
- Paulus of Aegina, opened hernia sac and reduced into belly by imagination with probe and applying cauterization to skin.
- In 1903, for large hernia and recurrent hernia Halsted used fascia graft.
- In 1950, Francis Usher used polypropylene as prosthesis[7].
- Preperitoneal mesh repair is introduced by Stoppa in 1973[2].
- Wantz’s introduced unilateral preperitoneal mesh repair.
- In classic 1973 Paper, Rives stated, “The problem which we must solve is not just a simple problem of technique”[9].
- In 1982, Ger performed first laparoscopic hernia by simply closing the peritoneal opening with staples.
- Ramirez introduced the component separation technique in 1990[10].
- Laparoscopic technique was introduced for incisional or ventral hernia since 1993[8].

ANATOMY[11, 12, 13]

Anterior abdominal wall has nine layers

- Skin
- Subcutaneous tissue -Camper's fascia
- Superficial fascia - Scarpa's fascia
- External oblique muscle
- Internal oblique muscle
- Transverse abdominus muscle
- Transversalis fascia
- Preperitoneal fat and areolar tissue
- Peritoneum

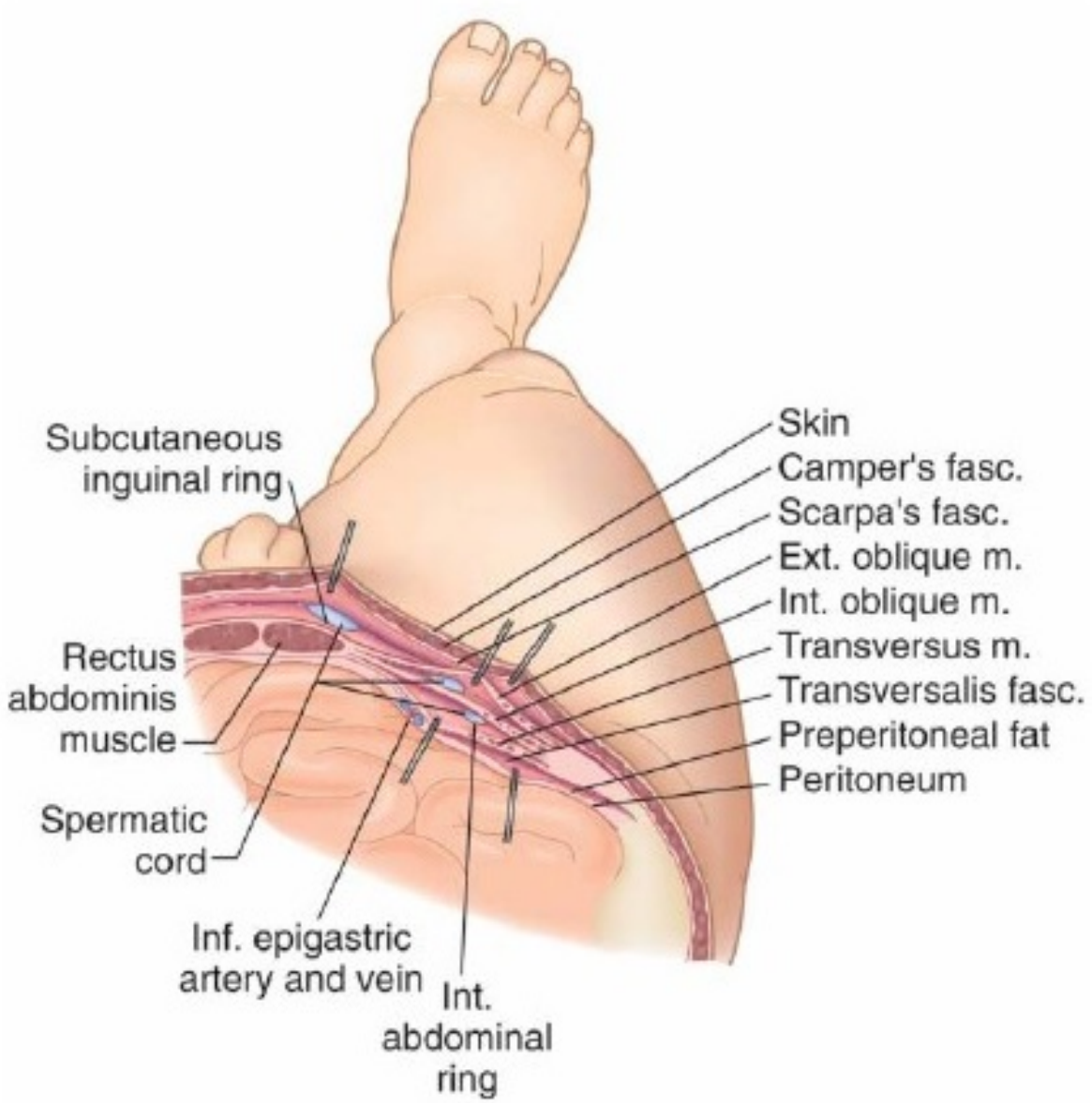


Fig : 1 Layers of Anterior Abdominal Wall

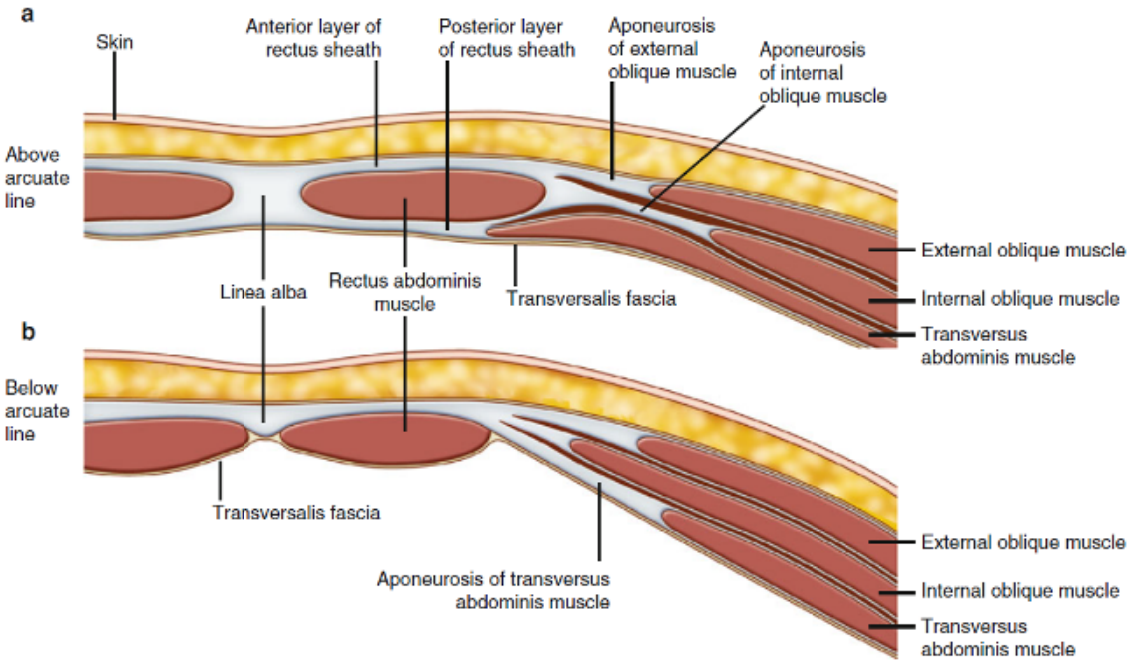


Fig : 2 The Arrangement of Muscles in Anterior Abdominal Wall

SKIN &SUBCUTANEOUS TISSUE

It is the second layer and deep to the skin which consist of the two fascia :

- Fascia camper
- Fascia scarpa

Fascia camper is the superficial layer which consists of bulky fat. Second layer of subcutaneous tissue is scapra's fascia which is dense fibrous tissue .It continues as fascia lata in the thigh.

EXTERNAL OBLIQUE MUSCLE

Origin : Lower seven ribs

Insertion : Posterior most fibres inserted into iliac crest,

At mid clavicular level fibres inserted into linea alba, Lower most fibres gives the form inguinal or Poupart's ligament between anterior superior iliac spine and pubic tubercle.

It is the longest, thick, flat abdominal wall muscle .Its direction is downwards and medially, as "Hand in Pocket "

INTERNAL OBLIQUE MUSCLE

Origin : Iliopsoas fascia, anterior 2/3 of the iliac crest an lumbodorsal fascia.

Insertion : Upper most fibres are inserted into lower 5 ribs and its cartilage.

Central fibres develop aponeurosis at the semilunar line. Above the semicircular line (just below the umbilicus) it acts as part of anterior and posterior rectus sheath. It forms a part of Anterior rectus sheath below the semicircular line . Lower fibres give to develop part of cremaster muscle around the spermatic cord.

Its direction is just opposite to External oblique apponeurosis from inferolateral to superomedial direction.

TRANSVERSE ABDOMINUS MUSCLE

It is the smallest muscle

Origin: Lower six costal cartilages

The spine of the lumbar vertebra , the iliac crest and the iliopsoas fascia .

Insertion : It continuously forms part of the anterior and posterior rectus sheath above the semicircular line.

Below the semicircular line it forms a part of anterior rectus sheath. In lower abdomen it joins with internal oblique muscle to form conjoint tendon which is part of inguinal canal boundaries.

HASSELBACH'S TRIANGLE

It is the site of Indirect inguinal hernia formation and is bounded

Medially	by lateral margin of rectus muscle.
Superolaterally	by the inferior epigastric artery
Inferiorly	by the inguinal ligament
Floor is formed	by transversalis fascia

TRANSVERSALIS FASCIA[14, 15, 16]

It is otherwise called groin's achilles tendon which is endoabdominal fascia. It prevents the formation of hernia by covering the trianglesof medial part of groin. It connects between transverse abdominus and iliopubic tract.

MYOPECTINEAL ORIFICE OF FRUCHAUD[15, 16]

It is common site for direct and indirect inguinal hernia, femoral hernia and interstitial hernia of groin.

Boundaries:

Medially	-	Central border of rectus muscle sheath
Lateral	-	Iliopsoas muscle
Superiorly	-	Conjoint tendon
Inferiorly	-	Superior pubic ramus

RECTUS ABDOMINUS MUSCLE

Origin : Anterior surface of 5, 6, 7th costal cartilage and xiphoid process.

Insertion : Pubic crest and pubic symphysis. It has 3-5 tendinous insertions which attached to anterior rectus sheath. There is no attachment to the posterior rectus sheath. Each rectus adjacent to each other which is separated by linea alba.

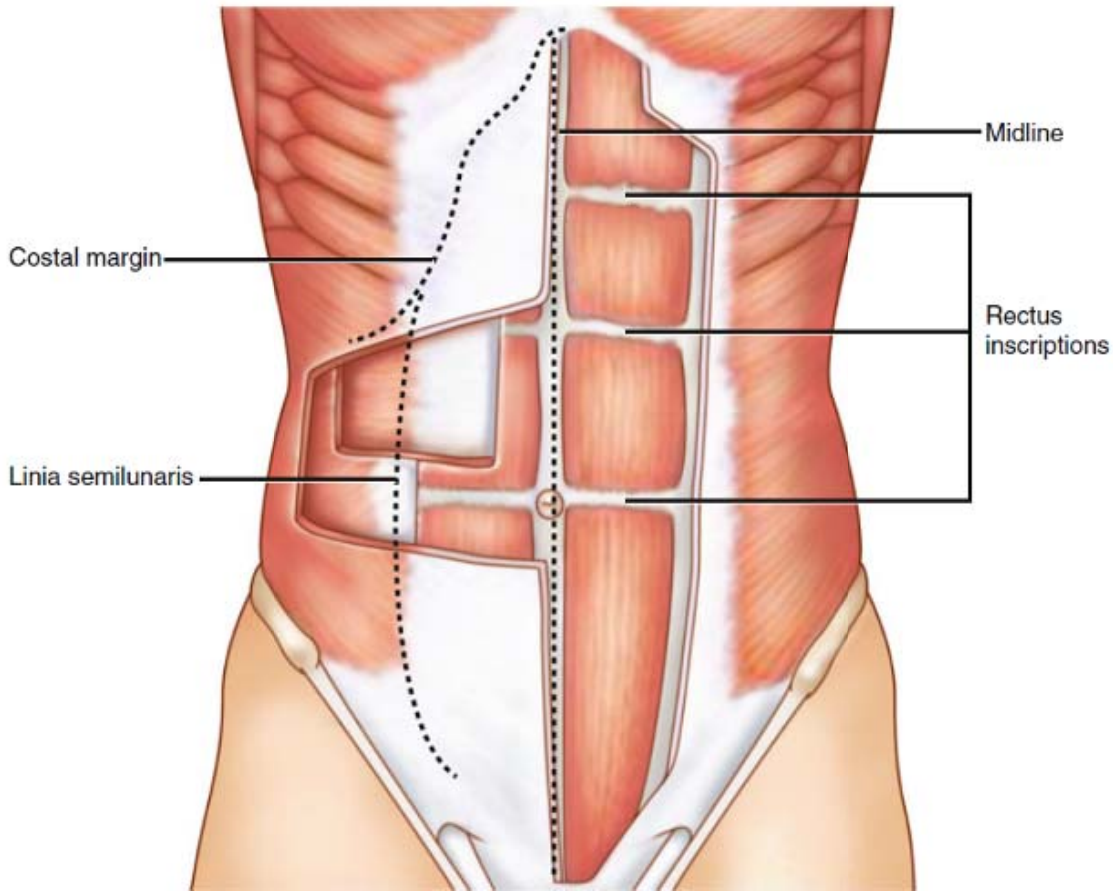


Fig : 3 Rectus Abdominus Muscles and Contents of Rectus Sheath.

PYRAMIDALIS

Pyramidalis presents in the lower abdomen with the Anterior rectus sheath. It originates from pubic tubercle and pubic symphysis ends in linea alba in midline, a region between umbilicus and pubic symphysis. Muscle site is variable in nature. Pyramidalis is supplied by inferior epigastric artery and deep circumflex iliac artery. Its branches cross each other and anastomosis takes place in midline which give trouble bleeding during lower midline surgical incision .It has nerve supply from terminal branch of subcostal nerve.

RECTUS SHEATH

The rectus muscle is covered by anterior and posterior rectus sheath above the semicircular line.Below the semicircular line, Rectus is covered by anterior rectus only.

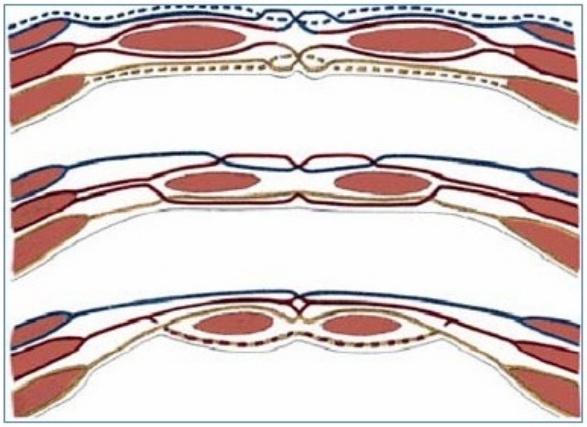


Fig : 4 Schematic Transverse sections through ventral abdominal wall

Below the semicircular line, Three aponeurotic layers going to develop the anterior rectus sheath, above Internal and external oblique develop the anterior sheath , internal and transverse abdominus develop in posterior sheath.

LINEA ALBA

In midline, band of dense fibres called as linea alba, which joins the two rectus muscle to close each other.

PREPERITONEAL SPACE AND PERITONEUM

Space between fascia transversalis and the parietal peritoneum is called as Prepritoneal space.

Retzius - It is defined as prevesical space, just posterior to the pubis

Bogros - Space just posterior to posterior lamina transversalis fascia.

CLOSE RELATED STRUCTURES:

1. Medial umbilical ligament
2. Median umbilical ligament
3. Falciform ligament of liver

4. Inferior epigastric artery and vein

5. Round ligament

6.Vas deferens and pampiform plexus

BLOOD SUPPLY

The anterolateral abdominal wall has blood supply from lumbar artery and last 6 intercostal artery, deep circumflex iliac artery and superior and inferior epigastric artery.

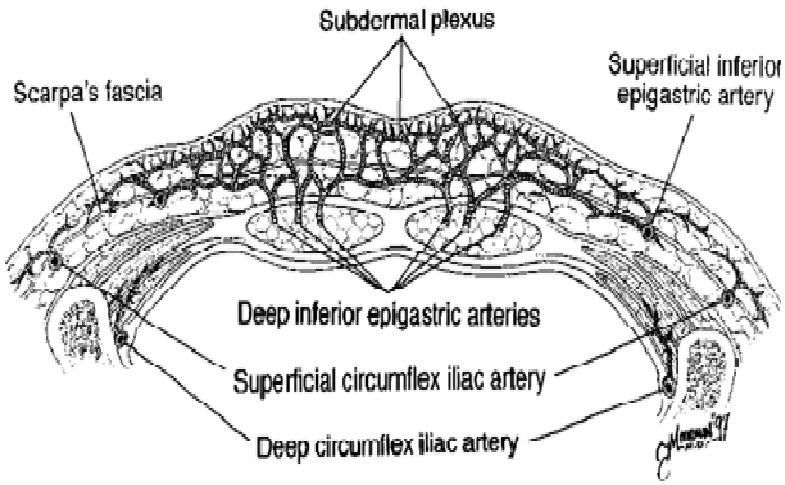


Fig : 5 The Blood supply of ventral abdominal wall

The lumbar and intercostal artery together with ilioinguinal, iliohypogastric, intercostal nerve pass between internal oblique and transverse abdominus muscle. Finally at midline, it supplies the rectus

muscle by the perforator arteries and communicates with the inferior and superior epigastric arteries.

SUPERIOR EPIGASTRIC ARTERY:

It is a branch of Internal mammary artery and reaches posterior surface of the rectus abdominus muscle. It descends through rectus muscle and anastomosis with epigastric artery.

INFERIOR EPIGASTRIC ARTERY:

It is a branch of External iliac artery and is just proximal to inguinal ligament. It courses through the preperitoneal space and enters into rectus muscle at level of semilunar line of Douglas.

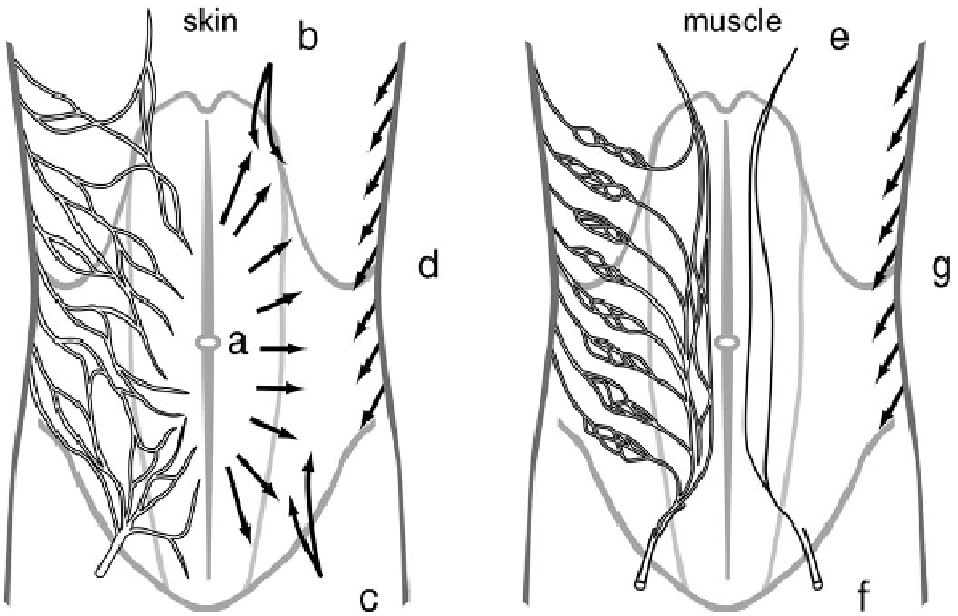


Fig : 6 The Schematic view-Direction of Blood supply and its anastomosis

The deep circumflex artery arises from external iliac artery just before or near the inferior epigastric artery and supplies the anterior abdominal wall musculature.

VENOUS DRAINAGE

Upper abdomen drains into superior vena cava internal memory, intercostal long thoracic veins. Below the umblicus, the abdomen drains into inferior vena cava through superficial epigastric, circumflex illiac and pudendal veins via saphenous vein.

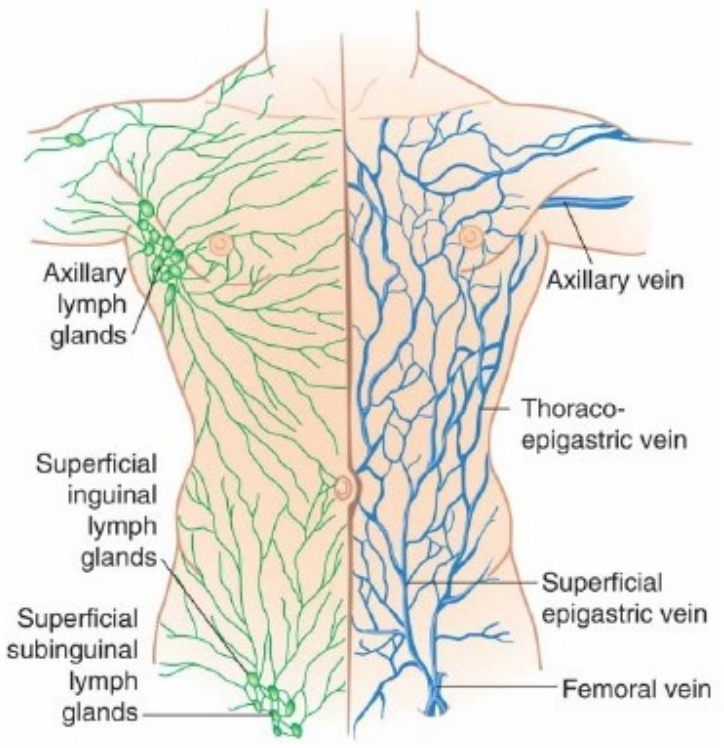


Fig : 7 Venous and Lymphatic Drainage of Anterior Abdominal wall

LYMPHATIC SUPPLY

Above umbilicus level, anterior abdominal wall lymphatics reaches the axillary group of lymph nodes. Abdominal wall below the umbilicus level drains into the superficial inguinal nodes.

NERVE SUPPLY

- Anterior abdominal wall is innervated or supplied by 7-12 thoracic nerve.
- Motor supplies is provided by 7th and 8th nerve
- Ilioinguinal and iliohypogastric nerve supplies the sensory innervation to hypogastrium and lower abdominal wall.

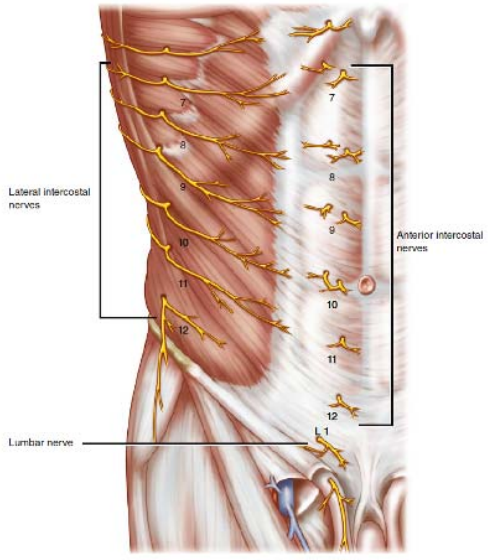


Fig : 8 Nerve supply of Anterior Abdominal wall

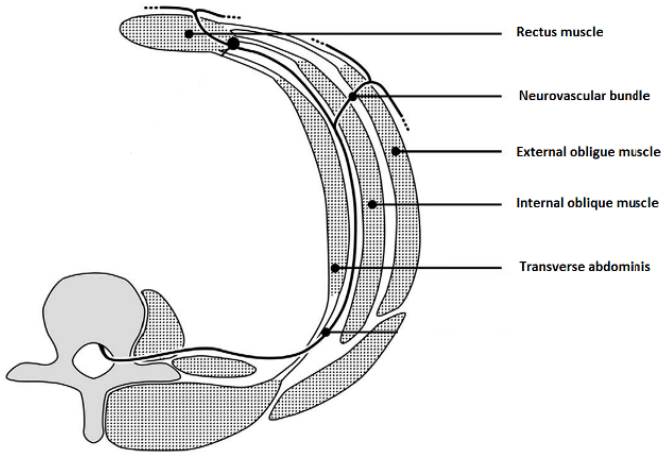


Fig : 9 Neurovascular Course in Anterior Abdominal wall

The Neurovascular innervations in the anterior abdominal wall is peculiar one. The Neurovascular bundle passes between internal oblique muscle and transverse abdominus muscle. There is no neurovascular course between the internal and external oblique muscles.

HERNIA

"Hernia is defined as abnormal protrusion of viscus or part of viscus through the wall that contain it."

Abdominal hernia in adults is classified into inguinal and ventral hernia.

CLASSIFICATION OF VENTRAL HERNIA:[17]

1. Congenital hernia

- Umbilical hernia - infant

-Gastrochisis

-Omphalocele

2. Acquired hernia

- In midline

- Diastasis recti

-Epigastric

- Umbilical hernia in adult

- Supravesical - anteior, posterior and lateral

- In paramedian

-Spigelian

-Interparietal - preperitoneal , interstitial and superficial .

3. Incisional hernia

- Midline incisional hernia
- Paramedian
- Transverse
- Port site hernia
- Special operative site hernia
- Boundry hernia
- Incisional hernia with loss of abdominal domains

4. Traumatic

- Penetrating
- Blunt Injury
- Destructive

Hernia occurs when there is loss or weakness of the function of muscle tendon and fascia. Here basic mechanism, pathology in fascia causing defect and failure of wound healing, over all cellular and extracellular molecular defect is common.

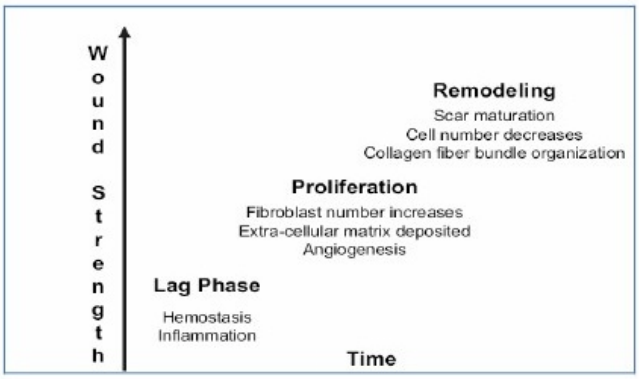
WOUND HEALING[18, 19, 20, 21]

Wound healing is a complex process. Several cells and cellular matrix are involved. The quality and quantity of connective tissue determines the stability of wound or scar site. The type 1 and type 3 collagen are involved. Type 1 collagen have tensile property which act against resistance. Type 3 collagen have less strength compared to type 1. In later ,a type 3 in converted into type 1 collagen. The lack or decreased synthesis of type 1 causes incisional hernia. Due to dysfunction of collagen and decreased ratio of type 1 and 3 , incisional hernia is commonly occurred.

SURGICAL WOUND HEALING

Process of wound healing:

- Lag phase
- Proliferative phase
- Remodelling phase



During laporotomy and hernia repair, there is delay or defective in repair mechanism which causes incisional hernia. Fascial or wound dehiscence is caused by early mechanical wound failure.

Wound infection, steroids, wound ischaemia affect the healing pathway .

INCISIONAL HERNIA

Hernia arising from previous surgical scar or trauma wound is called incisional hernia. Here, primary mechanism is failure or defective wound healing.

Fig : 10 Incisional Hernia

AGE AND GENDER [22]

Above 45 years, wound healing is delayed and defective cellular matrix. Older people have less migration of fibroblast and defective synthesis of collagen[23, 24] as well as prevalence of concomitant diseases.

Most of the studies suggest, men are commonly affected with incisional hernia compared to female[25, 26].

CAUSES :

LOCAL DISTURBANCES OF WOUND HEALING [27-30]

Wound infection, seroma formation, foreign bodies causes increase risk of incisional hernia formation. It produces cytokines and proteases which causes decreased production of fibroblast and wound stability. Tension suture causes necrosis that produces defective wound healing.

CONCOMITTENT DISEASE [28, 31, 32]

Poor nutritional status, diabetes mellitus, obesity, anemia, underlying malignancy are identified as independent risk to form the incisional hernia.

ENVIRONMENTAL INFLUENCE[33-35]

Smoking is one of the most common causes that develop hernia both primary and secondary. It is 4 fold increased risk for incisional hernia. ACE inhibitors, steroids, NSAIDS, chemotherapeutic agents affect the wound healing.

HEREDITARY CONNECTIVE TISSUE DISORDER[36-39]

Ehler- Danlos syndrome, cutis laxa , type 3 pre collagen disorder, osteogenesis imperfecta are associated with increased incidence of incisional hernia.

DEFECTIVE TECHNIQUE

Incisional hernia also occurs due to defective technique to close the abdomen and the choosing of incorrect materials cause to develop incisional hernia.

Midline incisional hernia is common compared to transverse incision because transverse suture is mechanically more stable because it encircles tissue collagen bundles. In vertical incision, we split the collagen bundles.[40]

Closure under tension causes increased incisional hernia formation. In the first post operative years the rate is 50 %, then 75 % in second post operative year and 90% in third year.[41]

Midline incision has highest rate of 10.5% compared to 7.5% in transverse incision and paramedian incision has 2.5%.[42]

Non absorbable monofilament has less incidence compared to absorbable suture materials. Jenkins realised that the suture length to incision ratio is 4:1 for abdominal closure.[43]

Incisional hernia is the iatrogenic hernia.

If there are multiple ways of treating a problem, there is no one good way"

REPAIR PRINCIPLE[44-48]

Indication for repair is the presence of incisional hernia because hernia causes multiple problems. Actual size of the hernia is defined as " The size of the parietal wall defect to be repaired, which is often significantly larger than the palpable clinical defect".

THE GOALS OF INCISIONAL HERNIA REPAIR

- Provision of dynamic muscular support
- Prevention of visceral eventration
- Incorporation of the remaining abdominal wall
- In tension-free manner, to restore the abdominal wall continuity.

In olden days, primary closure was done for incisional hernia but it has highest recurrence rates. Currently tension free repair by using prosthesis as mesh is the gold standard treatment. Main problem in mesh repair are infection, extrusion and fistula formation. Recently we are using myocutaneous flap cover, biological mesh to treat the incisional hernia.

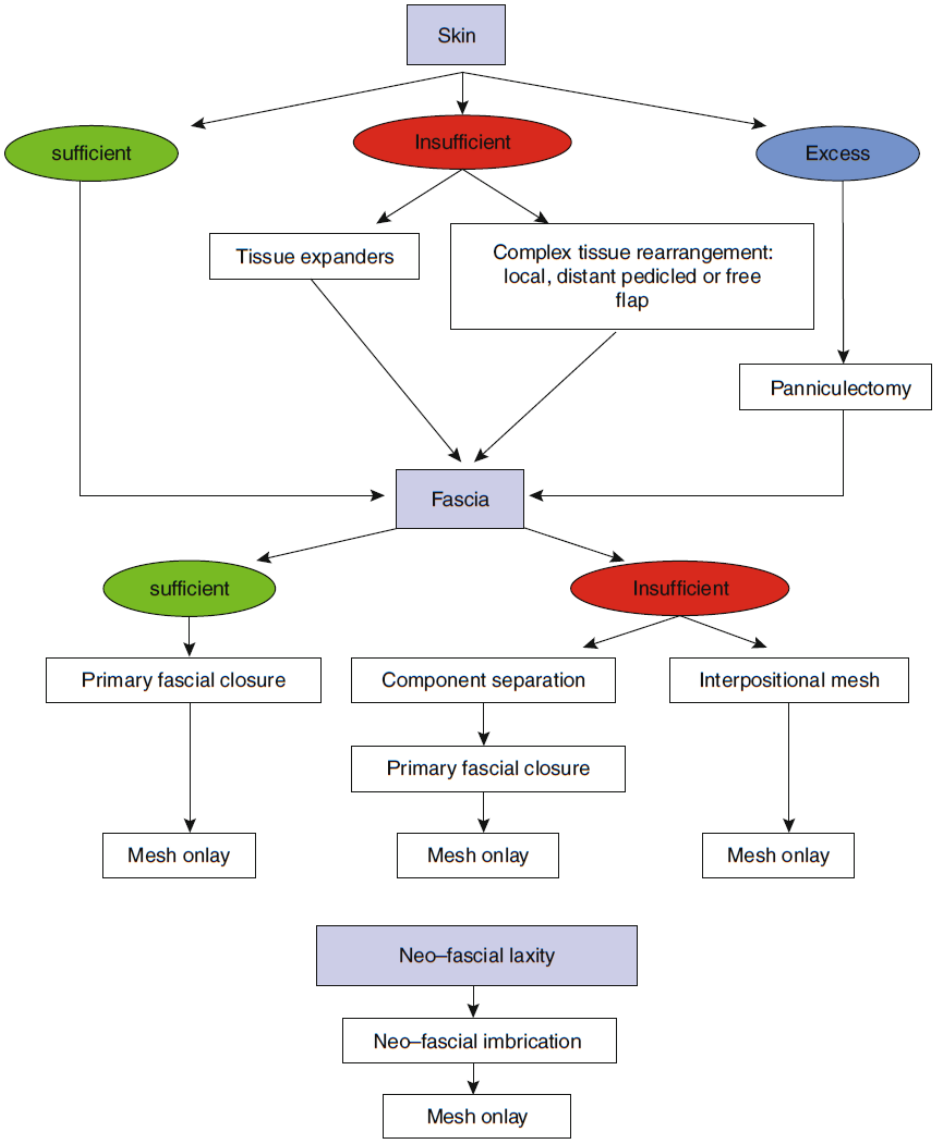


Fig : 11 The Algoritham for Abdonimal wall reconstruction (Onlay)

PRIMARY SUTURE REPAIR[49-53]

Simple suture repair was the gold standard technique until 1990s. Even in small defect (<5cm), high recurrence rate (25% to 63%) was reported in many studies.

Here, non absorbable monofilament suture material is used with suture to wound ratio of 4:1.[54]

Burger and his colleagues reported recurrence rate for suture repair as 63% compared to 23% in mesh repair.

MESH REPAIR

Increased usage of mesh for hernia repair because of high recurrence rate of incisional hernia after suture technique. Mesh allows tension free repair and to restore abdominal wall structural integrity.

Advantages :

- Tension free repair
- Absence of donor site morbidity
- Strength of the repair
- Easy availability
- Disadvantages
- Infection
- Mesh migration
- Mesh reaction
- Bowel erosion, if contact

The average rate of early and late mesh infection is 7% which depends on mesh type used.[55, 56]

Staphylococcus aureus and Staphylococcus epididymis are the commonest organisms. [56]

Law reported infected mesh causes weakening and predisposes to higher recurrence and also we must remove it if uncontrollable.

CUMBERLAND'S CHARACTERISTICS OF IDEAL MESH[16, 57]

1. Chemically inert
2. Not modified physically by tissue fluid
3. Should not be carcinogenic
4. Should not cause any allergic or hypersensitivity reaction
5. Pliable and movable
6. Resistant to mechanical strain
7. Should allow the tissue growth in it
8. Easily sterilized by conventional methods

IDEAL MESH PORTFOLIO[7]

1. Should not have adhesion potential
2. Good tissue integration
3. Should be cost effective
4. Good memory
5. Less shinkage
6. Should not affect patient's normal activity
7. Should not promote infection, fistula formation and seroma.

Mesh that fulfil the Cumberland's characteristics

- Dacron
- Monofilament or polyfilamentpolypropelene
- Polyster mesh (MERSILENE)
- Expanded polytetrafluoro ethylene (ePTFE)
- polyglactin 910 mesh (vicryl)
- Polyglycolic acid mesh (dexon)

TYPES OF MESH

- Synthetic Mesh
  - Non Absorable
    - Polyprophylene (Prolene)
    - Polythylene (Marlex)
    - Polyester (Dacron)
    - PTFE (Teflon/ Gordex)
  - Absorbable
    - Vicryl
  - Combined
    - Vipro
- Synthetic With Absorbable Barrier (Dual Mesh)
    - Parietex
    - Proceed etc
- Biological Mesh
    - Surgisis (Porcine Submucosa)
    - Alloderm (Cadaceric Human Dermis)

CHOOSING OF MESH

- Site of the Herina
- Size of the Herina : Small Vs Large
- Type of repair : Open Vs Lap
- Site of placement of Mesh : Inlay / Onlay / OPOM
- Surgeon’s Preference
- Cost factor

Abdominal wall tensile strength is calculated by the product of tension strength according to LaPlace's formula (△P=2T/r) and one of cross-section of the abdomen. According to Pascal's Principle, Abdominal wall pressure itself to protect the mesh position.

In coverage, maximum tensile strength required to close the anterior abdominal wall is 16N/cm.[56] All mesh have tensile strength approximately 32N/cm postoperatively interface between mesh and tissue is important which determines the durability and strength of mesh repair.

VARIOUS MESH REPAIR

- Onlay mesh repair
- Inlay mesh repair
- Sublay mesh repair
- Underlay mesh repair

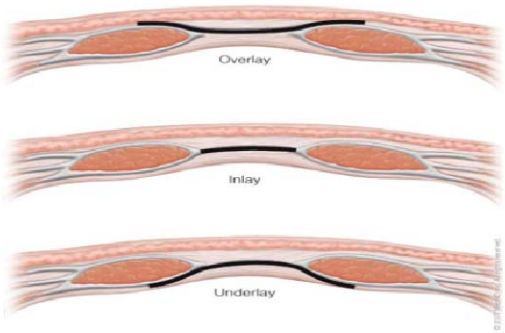


Fig : 12 The various mesh position

ONLAY MESH REPAIR

Most of the surgeons are using this technique nowadays because it is technically easy. Chevrel and Rath identified a recurrence rate of 18.4% without the use of mesh compared with 5.5% with the use of polypropeleneonlay mesh and 0.97% with the use of fibrin glue in addition to onlay mesh. Here major drawback is recurrence and wound related complications.

INLAY MESH REPAIR

It involves excision of the hernial sac and healthy facial margin identification. It provides tension free repair and avoids the wide undermining. Here the recurrence rate is high about 10-20%[49, 53]

SUBLAY MESH REPAIR

In sublay mesh repair, mesh is placed between visceral peritoneum and anterior abdominal wall. Here, the hernia sac is preserved , which avoids mesh being in direct contact with the bowel. The rule of this procedure is atleast 4 cm of mesh must be placed in contact with fascia. According to Pascal’s principle,it distributes the pressure in all areas. The pressure induced apposition aggravated the fibrous growth at mesh-fascial interface.

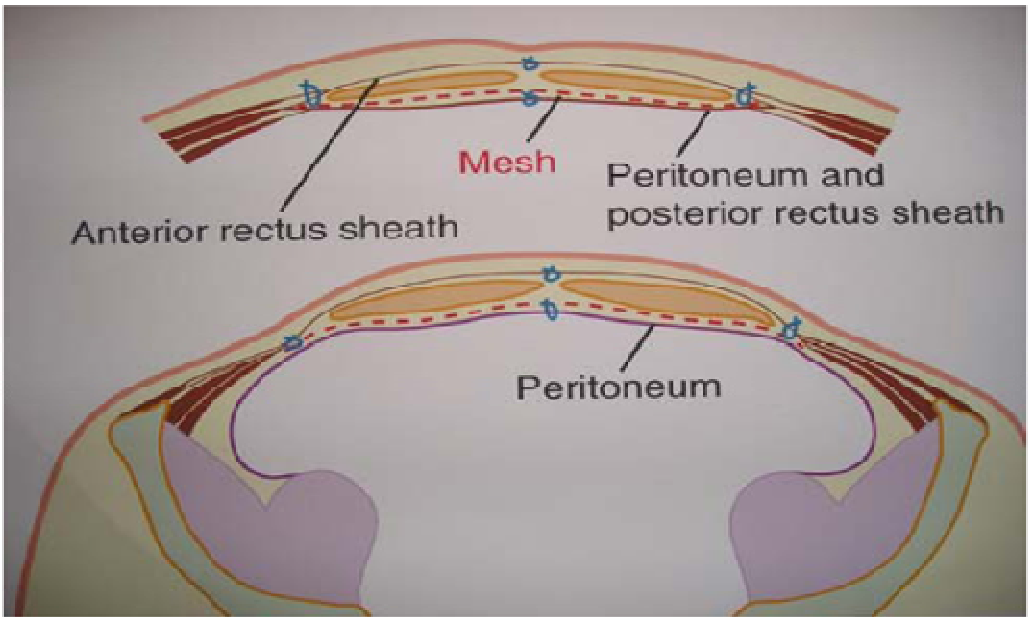
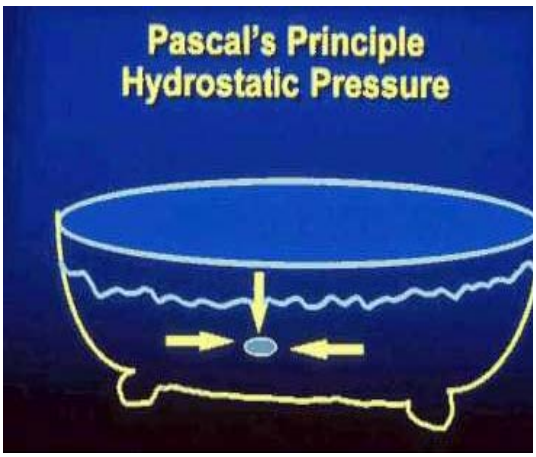


Fig : 13 Sublay Mesh Repair

After implantation , the prolene mesh shrink upto 30%[58, 59]. In this procedure recurrence rate is less than 10%.[60, 61]



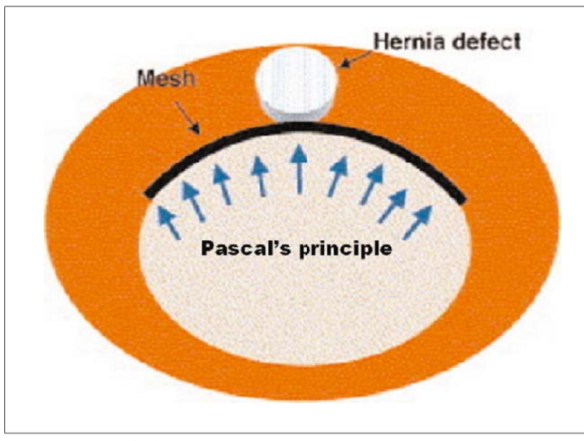


Fig : 14 Diagrammatic representation of Pascal's Principle Hydrostatic Pressure

INTRAPERITONEAL/ UNDERLAY MESH REPAIR

It secures the mesh placement and promotes tissue ingrowth between mesh and tissue. In this technique, various fixation available from approximation to full thickness fixation in the lateral border. Recurrence rate is less than 5%.[62]

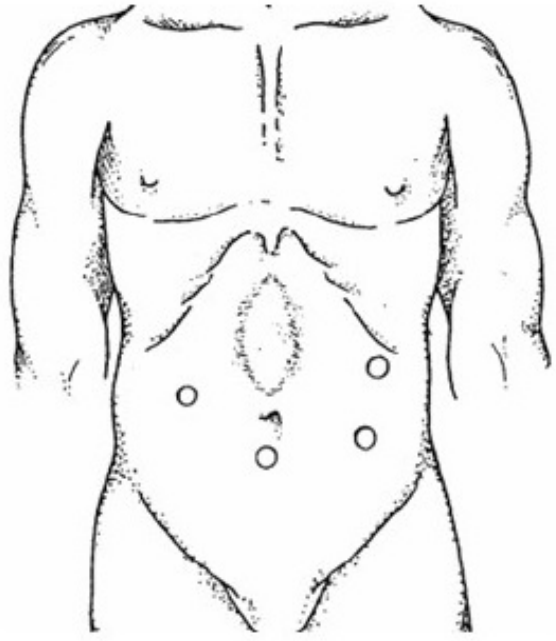


Fig : 15 DIAGRAM REPRESENTS LAPAROSCOPIC PORT POSITION

ADVANTAGES: [63-65]

- Lower recurrence rate 2%-5%
- Shorter hospital stay
- Decreased infection rate
- Wound complication is reduced

DISADVANTAGES: [66]

- There is no restoration of dynamic abdominal wall function
- Scar tissue (old surgical scar) is retained.

BIOPROSTHESIS

Major problem in prosthesis mesh is infection which causes recurrence. Bioprosthesis materials are derived from human and animal tissue which heals by using regenerative methods than scar tissue formation. It provides mechanical integrity because it has collagen base extracellular matrix.

ADVANTAGES :

- Tolerance of cutaneous exposure
- Resistence to infection
- Mechanical stability

DISADVANTAGES

- High cost
- Lack of long term follow up studies

COMPONENT SEPARATION TECHNIQUES

This technique is used to cover large defect which is introduced by Ramirez. It has two methods.

1. Classic component technique
2. Perforators preservation technique

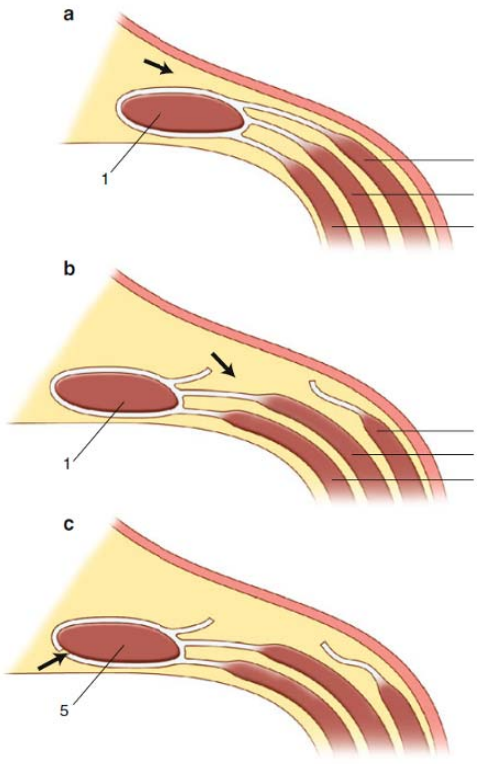
Classic Component Technique

Incision made around the wound scar mobilization of extensive skin flap is done away from the rectus muscles upto anterior axillary line. Then 1cm lateral to rectus, external oblique apponeurosis is incised from the costal margin to inguinal ligament. Sliding myocutaneous flap is created which consisting transverse abdominis and internal oblique muscle. After releasing the lateral rectus attachment, rectus muscle is mobilized medially. The posterior rectus sheath is incised longitudinally, if any additional mobilization is needed. Rectus is approximated medially in tension free manner. The major drawback of the procedure is skin necrosis and seroma formation.

Perforators Preservation Technique

In this technique, separate inguinal incision is made for fascial separation. After making incision, the balloon dissector is passed deep to external oblique muscle or apponeurosis. It advanced and inflated towards head end. The headlamp illumination narrow retractor and sponge are used to complete separation. By using utlrasonic shear, the external oblique apponeurosis is incised. All perforators are preserved in this procedure to avoid flap necrosis.

The Component Separation technique



a. Elevation of subcutaneous Flap

b. Dividing of External Oblique apponeurosis

c. External oblique falp elevation and dividing of posterior rectus sheath

Fig : 16 The Component Separation Technique

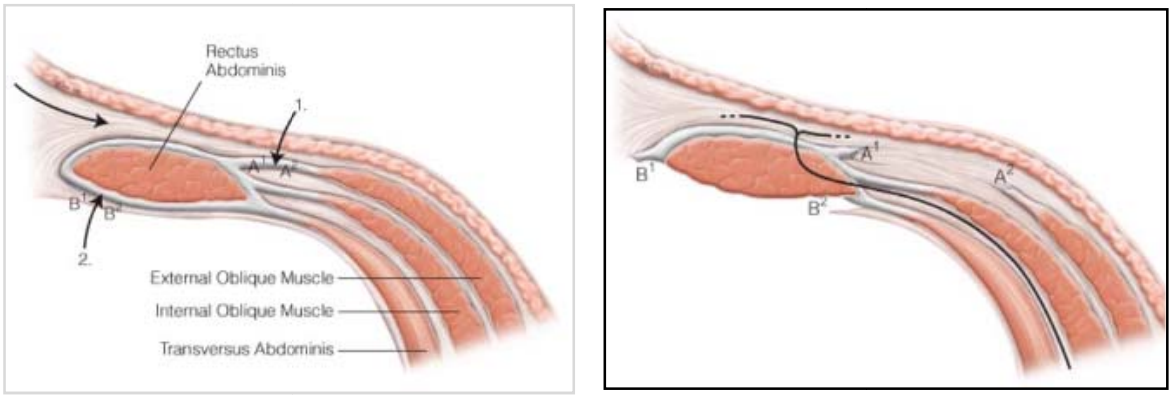


Fig : 17 The Component Separation Technique - Flap advancement in abdominal wall

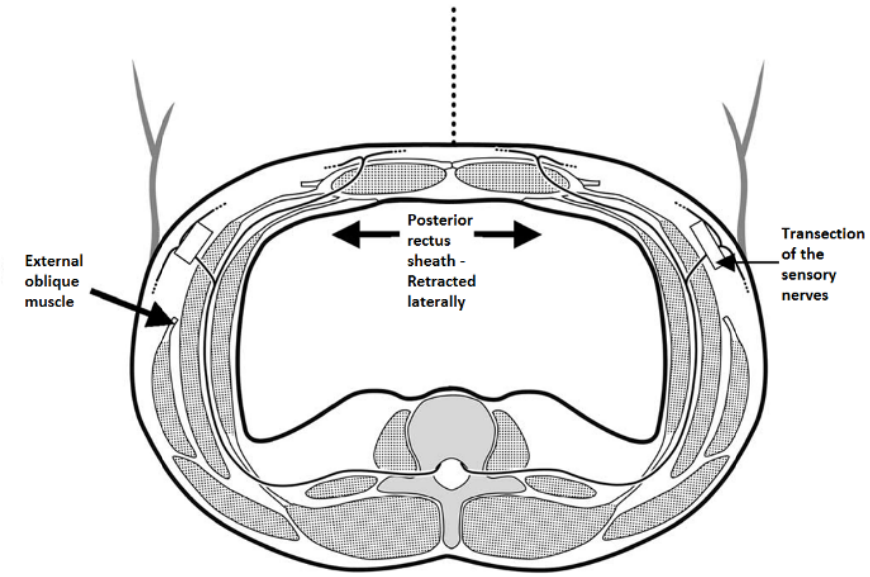


Fig : 18 Schematic transverse section of abdominal wall after completing component separation technique.

FLAP RECONSTRUCTION

Hernia which cannot be corrected by advancement technique, may be treated by local and distal flap.

Flaps used for abdomen defect	
Fasciocutaneous flap[46, 67-70]	
• Thorocoepigastric flap • Iliolumbarbipedicled flap • Groin flap	Used for upper 1/3rd wall defect Middle 1/3rd wall defect Lower 1/3rd wall defect
Local muscular flap[67, 68]	
• Rectus muscle flap[71, 72]	Based on superior epigastric artery and deep inferior epigastric artery. Used for midline defect. Recurrence: 30%; Wound complication: 25%[73]
• External oblique flap[74]	Based on posterior intercostal arteries. Used for para-median defects. Recurrence: 3%
Distal muscular flap (It is either free flaps or pedicle flaps)	
• Tensor fascia lata[75, 76]	Based on lateral femoral circumflux artery. It is not provide dynamic reconstruction. Donor site morbitity: 15% - 20% Distal necrosis: 20% - 25% Recurrence rate: 9% - 42%

• Antero lateral thigh flap[67, 77, 78]	Used for lower abdominal wall defect. Based on lateral femoral circumflux artery. Along with Tensor fascia lata, there is no recurrence.
• Rectus femoris muscle flap[79, 80]	Used for lower 2/3rd abdominal wall defect. Based on lateral femoral circumflux artery.
• Latissmusdorsi flap[81, 82]	Used for upper abdomen defect. Based on thorocodorsal pedicle.
• Gracillis muscle flap[83]	Used for lower 1/3rd abdominal wall defect. Based on medial circumflux artery.

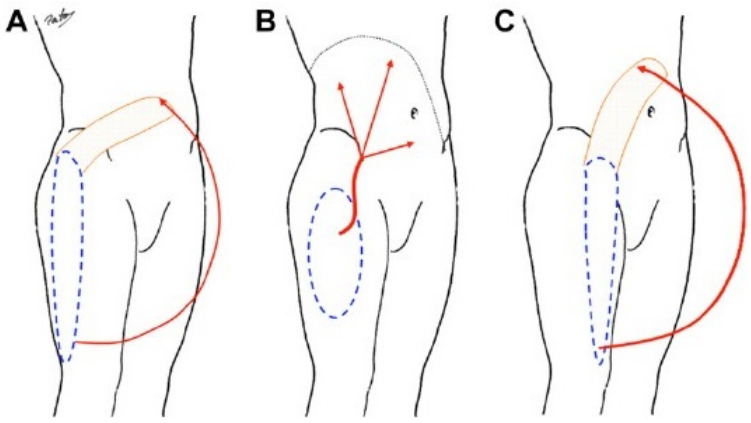


Fig : 19 The Flap Reconstruction

TISSUE EXPANSION[84, 85]

It provides autologous, well vascularized and innervated tissue for abdominal wall reconstruction. It is used for congenital defects and large hernias.

It is placed in subcutaneous plane or inter muscular plane. If we place in the avascular plane between external oblique and internal oblique muscle, external oblique apponeurosis allows external expansion and internally internal oblique apponeurosis expanded.

AIMS AND OBJECTIVES

1. To study the age incidence of incisional hernia.
2. To study the sex incidence of incisional hernia
3. To study the etiological factors.
4. To study the time of occurrence of incisional hernia.
5. To find the incidence of incisional hernia following various abdominal incisions.
6. To study to compare various technique of repair
   - Onlay technique
   - Sublay technique
   - Component separation technique
   - Laproscopy repair technique
7. To study about management of incisional hernia with loss of abdominal domains

METHODS AND MATERIALS

TITLE

A clinical study on incisional hernia

OBJECTIVE OF THE STUDY

To evaluate the incidence of incisional hernia based on age, sex , incision causing hernia, time of occurance from previous surgery.To compare the various surgical technique such as onlay, inlay, laproscopy mesh and componenet separation study.

SOURCES OF DATA

Patient admitted in our hospital with features of incisional hernia including my criteria are undergoing surgery for incisional hernia from July 2011 to June 2013.

METHODS OF COLLECTION OF DATA

It was collected by thorough history taking, clinical examination, investigations and collection of per operative and post operative data regarding procedure and complications and follow up.

STUDY DESIGN

Prospective study

STUDY PERIOD

July 2011 to June 2013

PLACE OF STUDY

Govt Mohan Kumaramangalam Medical College Hospital, Salem

SAMPLE SIZE

60 cases

ETHICAL CLEARANCE

Obtained from institutional ethical committee

INCLUSION CRITERIA

All cases presenting with features of incisional hernia in general surgery ward.

EXCLUSION CRITERIA

- Patient with associated blunt injury abdomen
- Patient with associated portal hypertension with ascites

- Patient associated with intra-abdominal malignancy and malignant ascites

- Patient with features suggestive of complications

STUDY METHODOLOGY

In this study, from patients who met the inclusion and exclusion criteria, written informal consent was obtained.

In proforma, history, clinical examination such as symptoms and signs are noted.

All patients underwent the following investigations

- Blood glucose and urea
- Serum creatinine
- Complete blood count
- Urine routine examination
- Xray chest PAview
- Xray abdomen erect or lateral decubitus view if needed
- Ultrasonogram abdomen and pelvis
- CT/MRI(if needed)

20 patients were subjected to onlay, 20 patients were sublay mesh repair; 10 patients were laproscopic mesh repair and 10 patients were component separation technique by randomization.

SURGICAL TECHNIQUE

Onlay Mesh Repair

Patients are placed in supine position. The incision is made around the scar tissue. Then deepening the incision is done. The scar tissue is excised then cutaneous flap is raised around the sac. In small sac, the sac is reduced. If sac is larger, excess sac is removed. Then healthy margin of anterior rectus sheath is approximated after suturing the sac. Complete haemostasis is achieved. Then defect size is measured and rectus approximated. Then prolene mesh is kept over the anterior rectus sheath.

Lateral extension of the mesh is 5cm from the defect site and fixed with anterior rectus by using 2-0 prolene material. 18G or 16G sized suction drain is placed in the subcutaneous plane to prevent the seroma formation and promotes granulation. Finally wound is closed layer by layer. Adequate dressing is applied.

Sublay Mesh Repair

Subcutaneous flap raised as in onlay mesh repair. After raising the subcutaneous flap, incision is made in virgin area over the anterior rectus sheath. The rectus muscle is separated and preperitoneal space is reached. Blunt dissection is made out around the sac. The myocutaneous flap is raised minimum 5cm away from the sac. Sac is reduced. If sac is larger in size, excess sac is removed. Peritoneum is closed by using 2-0 vicryl material. Mesh size is measured to place in preperitoneal space. Mesh lateral margin which is 5cm distal to the defect site and fixed with anterior myocutaneous flap. Suction drain is kept in preperitoneal plane and subcutaneous plane. Wound is closed layer by layer. Adequate dressing is applied.

Component Separation Technique

Eliptical incision is made in the the scar site. Peritoneal cavity is entered. Decapping of the scar and excision of scar is done. Subcutaneous flap is raised from the rectus sheath and the external oblique apponeurosis about 5cm away or lateral to the rectus border. Incision is made over external oblique apponeurosis 1cm lateral to rectus border from the inguinal ligament to costal margin. External oblique apponeurosis myofasial flap is raised from the internal oblique apponeurosis upto mid

axillary line. This is avascular plane. Posterior rectus sheath is incised if needed. Same procedure is followed in opposite side also. Finally anterior rectus sheath is medialised on both sides. Complete haemostasis is achieved. After keeping the suction drain in place, wound is closed layer by layer.

By this method, if we do in bilateral rectus complex mobility, we can achieve to cover 20cm defect in umbilical region(mid abdomen), 12cm defect in upper abdomen and 10cm defect in lower abdomen defect.

Laparoscopic Mesh Repair

In laparoscopic method, three port we used. The port sites are depends on hernial , site. For midline hernia, we used three ports in left hypochondrium, left lumbar region and left iliac fossa. All are 5mm or 10mm port. We used 30 degree telescope after creating pneumoperitoneum Adhesiolysis is done. Content is reduced and defect is identified. Dual mesh was placed under the parietal peritoneum and tagged with anterior abdominal wall using 2-0 prolene materials in the lateral margin of the mesh. After the mesh was fixed, pneumoperitoneum was released. All ports were removed and wound was closed layer by layer.

POST OPERATIVE EVENTS

Patient was shifted to ward and adequate analgesics and antibiotics were given. Oral fluids were started after 8 hours of surgery. Diet was given if patient was tolerated. If patients improved clinically, patient were discharged and reviewed after one week. Patients were advised to come for regular follow up.

ASSESSMENT TOOLS

PER OPERATIVE COMPLICATION

Bleeding and peritoneal tear (significant), bowel injury and bladder injury were taken as assessment factors.

POST OPERATIVE COMPLICATION

Wound Infection And Wound Dehiscence:

Wound infection causes premature busting of the wound along the suture line. It requires resuturing of the wound and adequate antibiotic covering.

Seroma:

Collection of the serus discharge in the wound called as Seroma which is avoided by keeping the suction drain in the flap surface. If persistent seroma is occurred, then we must let it out from the wound.

Pelvic Collection:

It is due to inadequate heamostasis and peritoneal lavage.

Pain

Pain is an important assessment tool. Post operative pain was managed with analgesics.

Mesh infection

Suppurative infection of the wound with exposure of the mesh with discharge.

Recurrence

Bulge or swelling was appeared during cough or straining in the post operative follow up.

Hospital stay

Patient admission and discharge times are noted to calculate the hospital stay.

OBSERVATION AND RESULTS

AGE INCIDENCE

In our study of 60 cases, Peoples of age group from 24 yrs to 75 yrs presented with features of incisional hernia. Mean age was 48.13 yrs.

Age groups	No. of cases	Persentage
≤30 yrs	8	13.3%
31 – 40yrs	14	23.3%
41 – 50yrs	14	23.3%
51 – 60yrs	11	18.3%
≥ 60yrs	13	21.7%
Total	60	100%

Table : 1 Age Incidence of incisional hernia

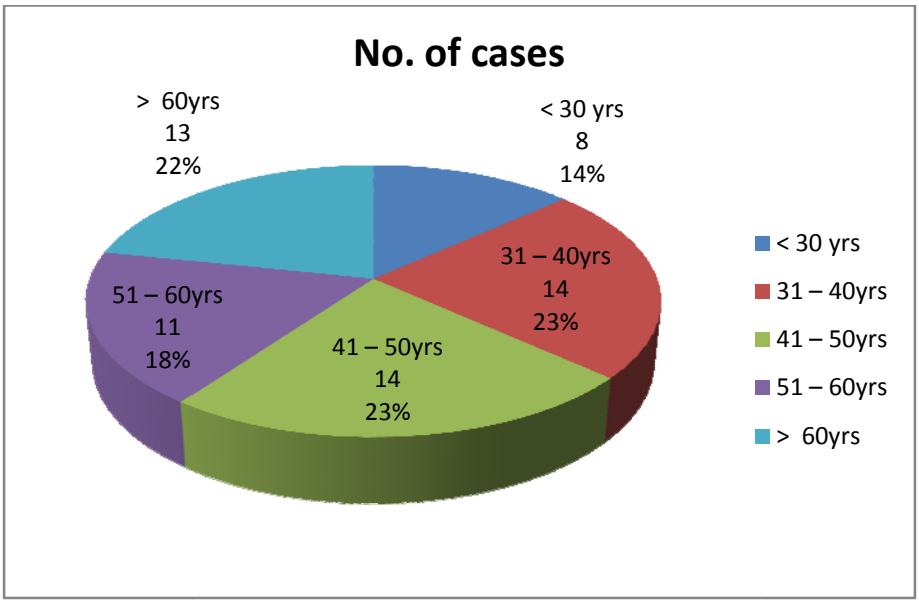


Chart: 1 Age Incidence of incisional hernia

SEX INCIDENCE

In our study of 60 patients, 37 patients were females and 23 were males. Hence about 62% of incisional hernia occurred in females.

Sex	No. of cases	Percentage
Male	23	38.3%
Female	37	61.7%
Total	60	100%

Table : 2 Sex Incidence of incisional hernia

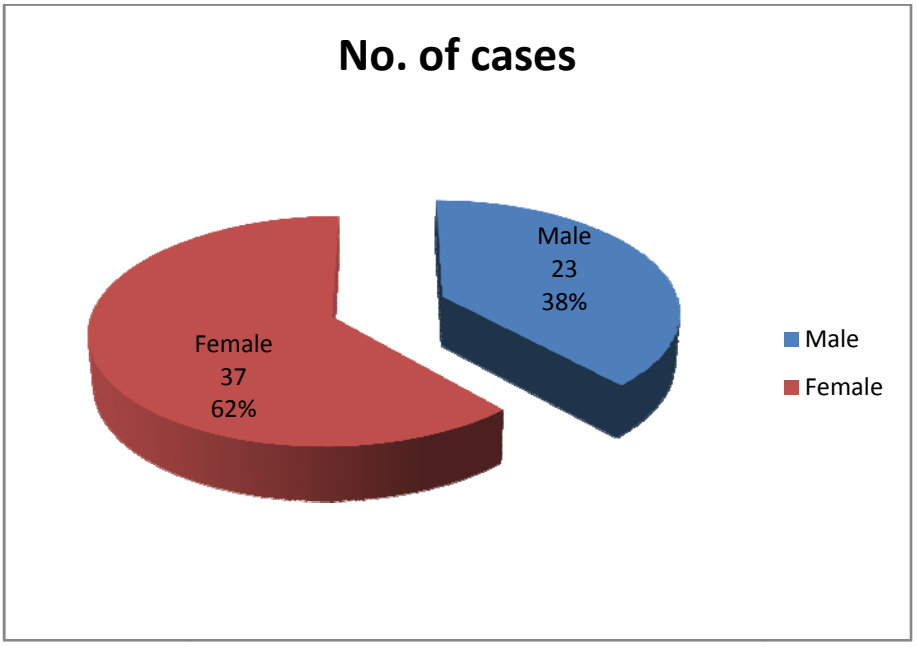


Chart : 2 Sex Incidence of incisional hernia

Incidence in females - 62% , Incidence in males - 38%

PREVIOUS SURGERY

In our study of 60 patients with Incisional hernia, 35 patients had previous history of Emergency laparotomy and 13 had previous history of LSCS and few others have history of hysterectomy(8), cholecystectomy(3), and sterilisation(1).

Hence patients with previous laparotomy history had more incidence of Incisional hernia(58%), followed by LSCS(22%).

Previous surgery	No of case	Percentage
Emergency Laparotomy	35	58.3%
LSCS	13	21.7%
Hysterectomy	8	13.3%
Cholecystectomy	3	5%
Sterilisation	1	1.7%

Table : 3 Types of Surgery causing incisional hernia

PREVIOUS SURGERY

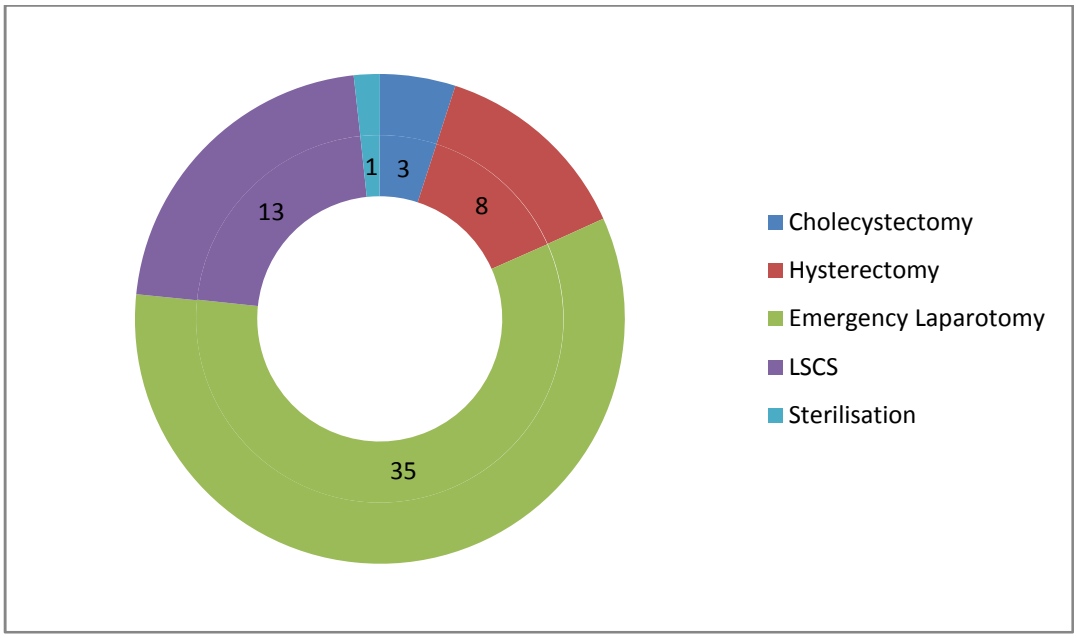


Chart: 3 Types of Surgery causing incisional hernia

Incidence of incisional hernia following

Emergency Laparotomy - 58%

LSCS - 22%

Others - 20%

VARIOUS INCISIONS

In our study of 60 cases, patients with median vertical incision(50%) had more incidence of incisional hernia compared to Pfannensteil incision(26.7%).

Various Incisions	No. of cases	Percentage
Median Vertical	30	50
Pfannensteil	16	26.7
ParaMedian	6	10
Port Site	2	3.3
Sub Costal	3	5
Transverse	4	6.7
Lumbar	1	1.7

Table: 4 Types of incision causing incisional hernia

VARIOUS INCISIONS

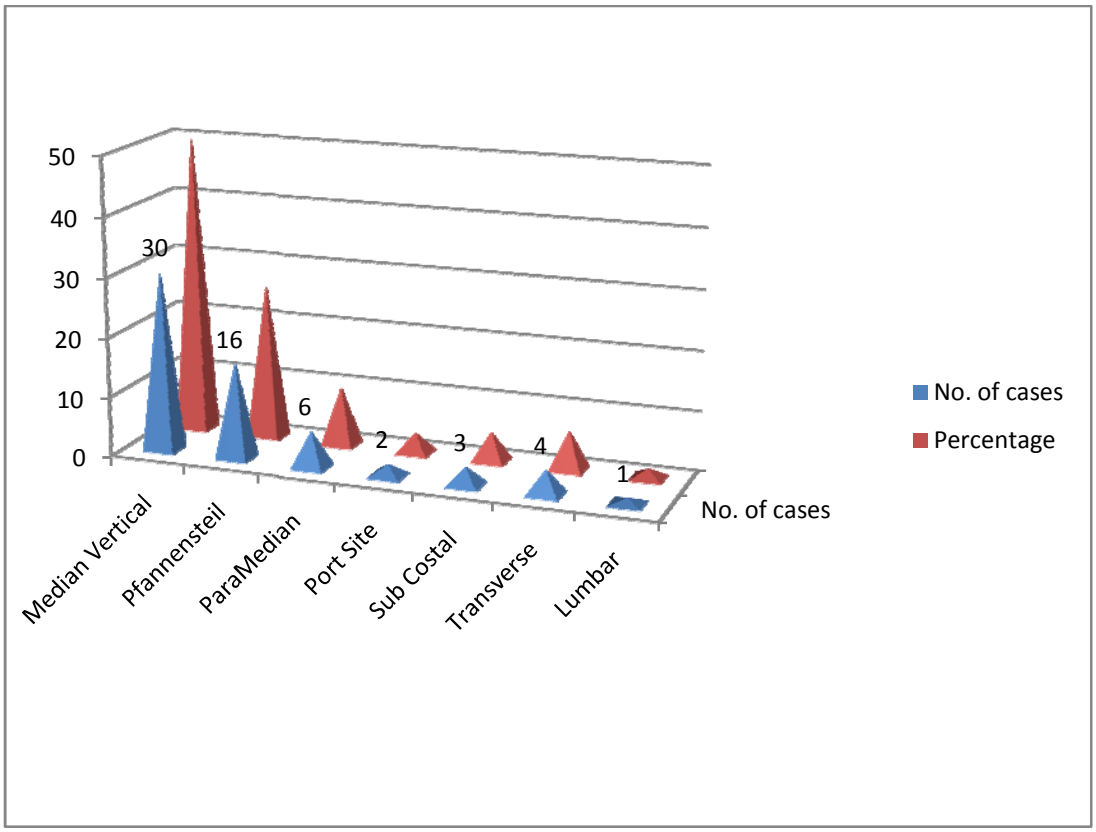


Chart: 4 Types of incision causing incisional hernia

<u>Incidence of incisional hernia following</u>

Median vertical incision – 50%

Pfannensteil incision – 26.7%

PREVIOUS SURGICAL COMPLICATIONS

In our study of 60 patients, about 21 patients experienced wound dehiscence (for which resuturing done previously), 19 patients had wound infection,14 had cough, few others urinary syndromes and constipation and about 12 didn't experience any complications after previous surgery.

This reveals that patients with wound dehiscence and secondary suturing (35%) had more incidence incisional hernia compared to wound infection (32%).

Previous Surgical Complications	No. of cases	Percentage
NIL	12	20%
COMPLICATION	48	80%
Cough	14	23.3%
Wound Dehiscence	21	35%
Wound Infection	19	31.7%
Urinary Syndrome	6	10%
Constipation	5	8.3%

Table: 5 Previous surgical complications causing incisional hernia

PREVIOUS SURGICAL COMPLICATIONS

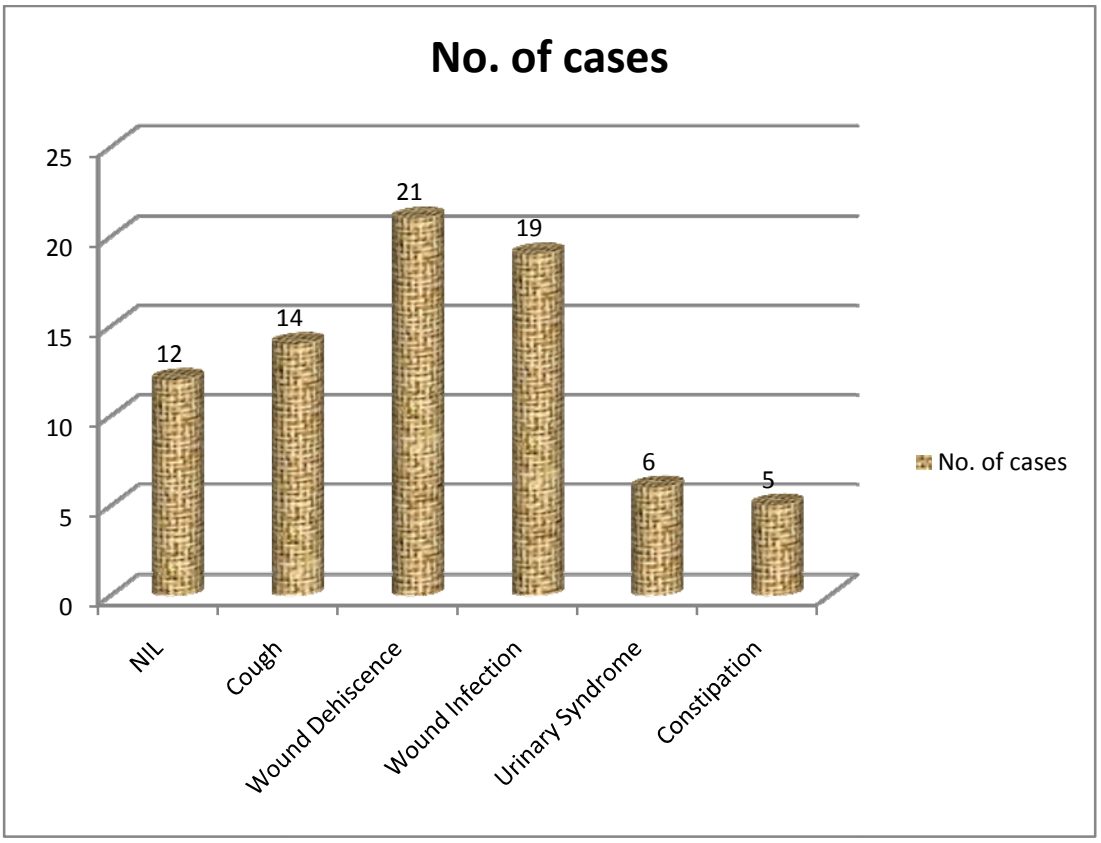


Chart: 5 Previous surgical complications causing incisional hernia

Incidence of incisional hernia following

Wound dehicence and resuturing – 35%

Wound infection - 32%

DURATION OF OCCURRENCE

AFTER PREVIOUS SURGERY

In our study of 60 cases, incisional hernia occurred within 1 yr of previous surgery in 47% of cases and in about 28% cases it occurred in 1 - 2 year duration of previous surgery.

Years	<=1 year	1-2 year	2-3 year	>3 year
No. of cases	28	17	12	3
Percentage	46.7%	28.3%	20%	5%

Table: 6 Time period for the onset of incisional hernia

DURATION OF OCCURRENCE

AFTER PREVIOUS SURGERY

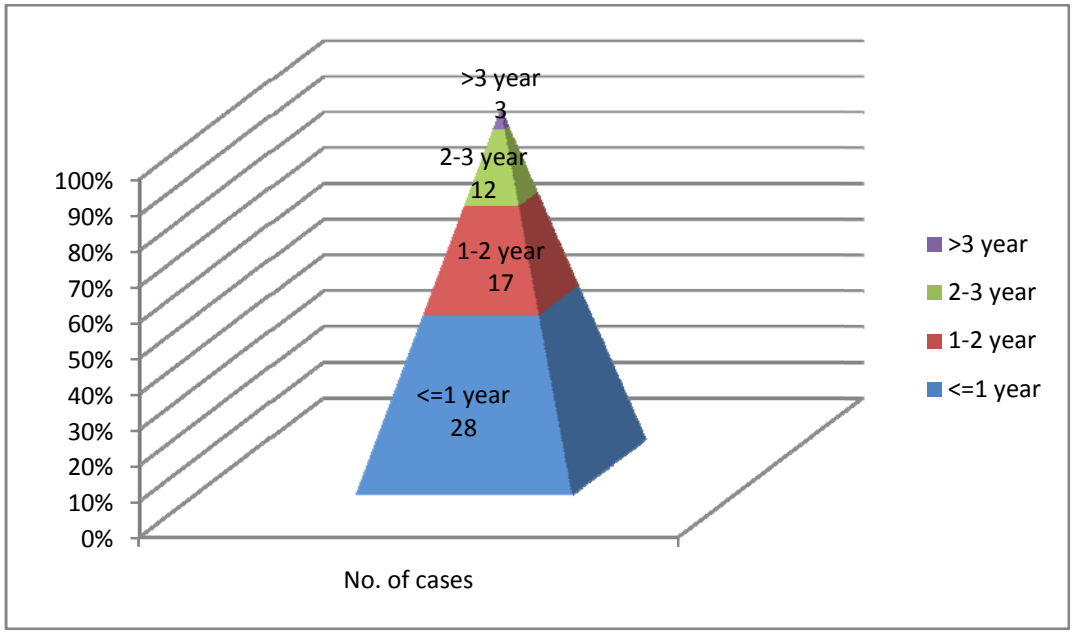


Chart: 6 Time period for the onset of incisional hernia

Duration of occurrence after previous surgery

Within 1 year - 47%

Within 1 - 2 year - 28%

After 2 years - 25%

PROCEDURE DONE

In our study of 60 cases with incisional hernia, we proceeded with 20 cases onlay repair, 20 sublay repair, 10 component separation repair and 10 laparoscopic repair.

Procedure	No. of cases	Percentage
Onlay	20	33%
Sublay	20	33%
Component	10	17%
Laparoscopy	10	17%

Table: 7 Various incisional hernia repair

PROCEDURE DONE

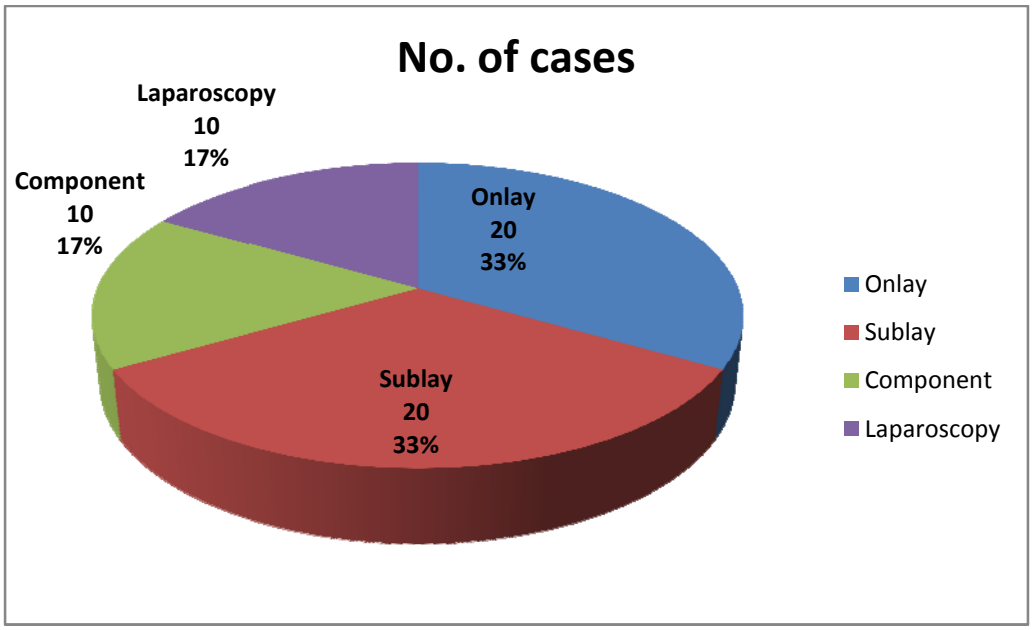


Chart: 7 Various incisional hernia repair

Procedures Done For Incisional Hernia

onlay and sublay repair - 33% cases

component separation and laparoscopic repair - 17% cases

PER-OPERATIVE COMPLICATIONS

In our study of 60 cases, while comparing onlay / sublay / component separation technique / laparoscopic repair in the treatment of incisional hernia,

- 25% of onlay repair patients had per operative bleeding,
- 15% of sublay repair patients had peritoneal tear,
- 10% of component separation repair patients had per operative bleeding,
- 20% of laparoscopic repair patients had per operative bleeding

Per-op Complications	Onlay (20 cases)		Sublay (20 cases)		Component (10 cases)		Laparoscopy (10 cases)	
	cases	%	cases	%	Cases	%	Cases	%
Bleeding	5	25%	2	10%	1	10%	2	20%
Peritoneal Tear	-	-	3	15%	-	-	-	-
Bowel injury	-	-	-	-	-	-	-	-
Bladder injury	-	-	-	-	-	-	-	-

Table: 8 The complications of Per-operative period

PER-OPERATIVE COMPLICATIONS

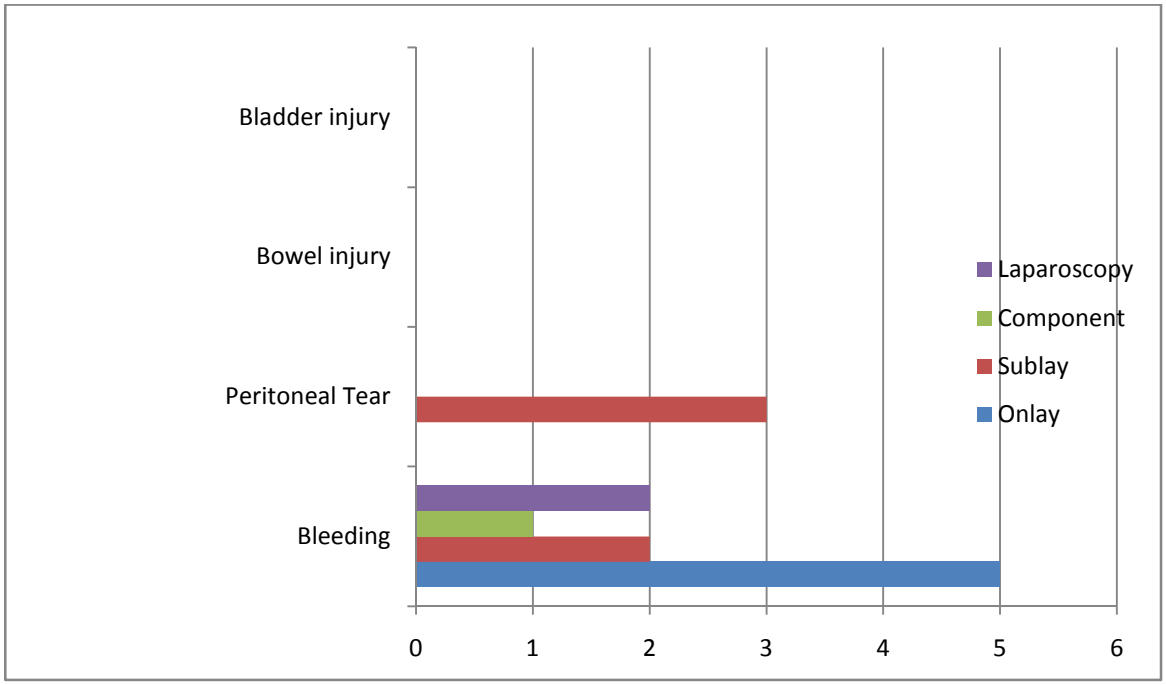


Chart: 8 The complications of Per-operative period

Bleeding is the most common complication that occurred in 25% of onlay repair, 10% of sublay repair, 10% of component separation technique and 20% of laparoscopic repair.

Peritoneal tear occurred in 15% of sublay repairs.

POST OPERATIVE COMPLICATIONS

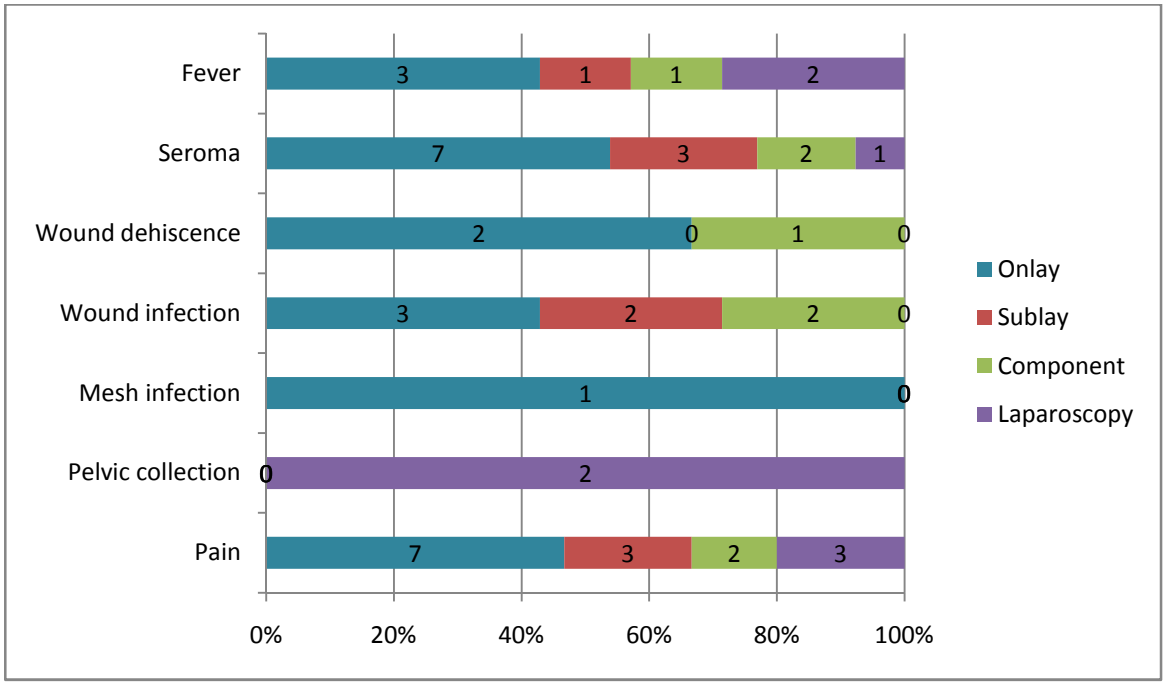
In our study, 35% of onlay repair patients experienced post operative pain and seroma collections, 15% of sublay repair patients experienced post operative pain and seroma, 20% of component repair patients experienced post operative pain, wound infection and seroma, 30% of laparoscopic repair patients experienced post operative pain.

Few others experienced wound dehiscence, wound infection, post operative fever and mesh infection.

Post-op complications	Onlay (20 cases)		Sublay (20 cases)		Component (10 cases)		Laparoscopy (10 cases)	
	cases	%	Cases	%	cases	%	cases	%
Pain	7	35%	3	15%	2	20%	3	30%
Pelvic collection	-	-	-	-	-	-	2	20%
Mesh infection	1	5%	-	-	-	-	-	-
Wound infection	3	15%	2	10%	2	20%	-	-
Wound dehiscence	2	10%	-	-	1	10%	-	-
Seroma	7	35%	3	15%	2	20%	1	10%
Fever	3	15%	1	5%	1	10%	2	20%

Table : 9 The complications of Post-operative period

POST OPERATIVE COMPLICATIONS



Cahrt : 9 The complications of Post-operative period

HOSPITAL STAY

In our study, about 70% of onlay cases required 1 - 2 week of hospital stay, 65% of sublay cases required just 1 week of hospital stay, 80% component separation repair required 1 - 2 week of hospital stay, 30% of laparoscopic repair required 1 - 2 week of hospital stay.

Hospital Stay	Onlay		Sublay		Component		Laparoscopy	
	cases	%	cases	%	cases	%	cases	%
≤7 days	1	5%	13	65%	1	10%	7	70%
7-14 days	14	70%	7	35%	8	80%	3	30%
>14 days	5	25%	-	-	1	10%	-	-
Mean	**11**		**8**		**10**		**8**	

Table : 10 Hospital Stay in various technique

HOSPITAL STAY

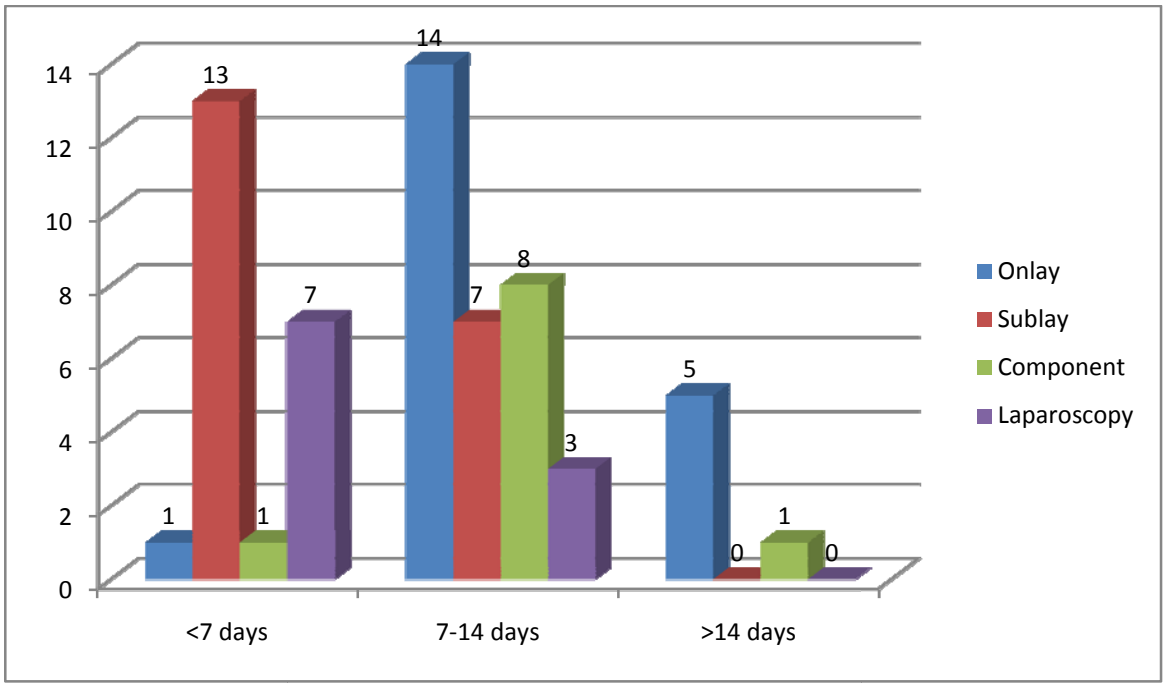


Chart : 10 Hospital Stay in various technique

Most of the sublay repairs and laparoscopic repair required <1 week of hospital stay and other techniques required 1 - 2 week of hospital stay mostly.

FOLLOW UP

ON FOLLOWING UP IN OUR STUDY,

- 25% of onlay cases had chronic pain and 10% had recurrence of incisional hernia,
- 5% sublaycaes, component separation repair cases and laparoscopic repair cases had chronic pain.

Follow-up	Onlay 20 cases		Sublay 20 cases		Component 10 cases		Laparoscopy 10 cases	
	cases	%	cases	%	cases	%	cases	%
Chronic pain	5	25%	1	5%	1	5%	1	5%
Recurrence	2	10%	-		-		-	

Table : 11 Follow up

FOLLOW UP

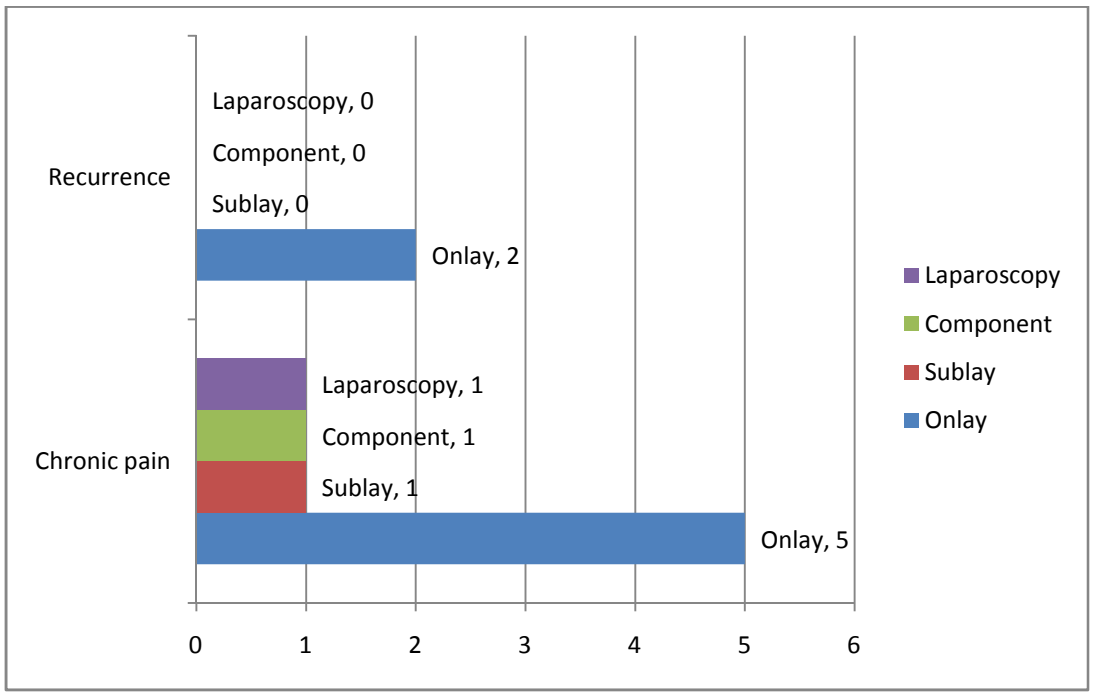


Chart : 11 Follow up

DISCUSSION

I have studied about 60 cases of incisional hernia. 20 cases were operated using onlay mesh repair and 20 cases using sublay mesh repair. 10 cases were operated by the component separation technique and remaining 10 cases by Laparoscopic technique. The collected information was analyzed.

In the present study, the youngest case was 24 years and oldest being 75 years. The mean age of the patients presenting with incisional hernia was 48.13 years. Here most of the cases with incisional hernia had reported in 4^{th} and 5^{th} decade of life.

Carlson et al identified the patients with incisional hernia were between 25 to 90 years and mean age of 60.3 years. In our study, most of them are 4^{th} and 5^{th} decade of life because predominance of female patient who underwent surgery for childbirth.

In this study, male to female sex ratio was 2:3. 38.3% are male and 61.7% are female patients with incisional hernia. Regnad et al found male to female ratio is 1:5 in his study. Female patient had higher incidence of incisional hernia because of repeated pregnancy causing

laxity of abdominal wall and obesity which caused infection post operatively.

In our study, Emergency Laparotomy wound causing incisional hernia is 58.3% which is the most common previous surgical procedure compare to others such Cholecystectomy(5%), Hysterectomy(13.3%), LSCS(21.7%) and sterilization(1.7%).

Out of 60 patients, most of them operated for emergency surgery such as duodenal perforation, intestinal obstruction and others.

Patience with median vertical incision (50%) had more incidence of incisional hernia compared to others. In present study, I found incisional hernia with pfannensteil incision (26.7%), para median incision(10%), port site incision (3.5%), sub costal incision(5%), transverse incision(6.7%), lumbar incision(1.7%).

Most of the study reported midline vertical incision is most common incision causing incisional hernia compared to others. Report of our study also support to this point.

Most of the patients with port site hernia underwent the laparoscopic procedure. Because all of them had small sized hernia which is best suited for laparoscopic procedure.

Among 60 patients in our study about 35% of patients experienced wound dehiscence and 31.7% patients had wound infection in previous surgery which was most common complication to develop incisional hernia.

Buchnall TE et al reported that previous surgery had been complicated by post operative wound infection in 48.8% developed hernia. Larson et al reported 35.9% and Bose had 53.6%.

The incidence of cough in post operative complication in previous surgery was 23.3% among the 60 patients in our study. Incidence of wound related complications were most common compare to others such as cough, urinary symptoms, constipation.

Most of them developed incisional hernia within one year of their post operative period(46.7%). Only 5% patients developed the incisional hernia after three years from previous surgery. Many studies support this report.

In this study, 25% patients had bleeding per operative during onlay mesh repair, 10% patients in sublay, 10% patients in component separation technique, 20% in laparoscopy procedure during adhesiolysis.

One patient had bleeding in onlay and component separation technique which was managed by blood transfusion and supportive IV fluids.

Three patients had peritoneal tear during sublay mesh repair due to previous surgical adhesion. The peritoneal tear was sutured using 2-0 vicryl material. No one had bladder injury or bowel injury in our study.

The post operative wound infection was 3 patients(15%) in onlay mesh repair, 2 patients(10%) in sublay mesh repair, 2 patients(20%) in component separation technique. All were managed by antibiotics based on wound culture and sensitivity. Wound dehiscence occurred to two patients in onlay mesh repair, one patient in component separation technique, which was managed by resuturing. The post operative periods were uneventful.

In onlay mesh repair, one patient was affected by mesh infection. Infection was controlled with antibiotics. Post operatively patient was treated successfully and discharged well.

Generally pain is the significant problem in hernia surgery. Pain developed to 7 cases in onlay mesh repair, 3 cases in sublay mesh repair, 2 cases in component separation technique. According to this study, pain

is mostly occurred in onlay mesh repair. In laparoscopic procedure, pelvic collection occurred in two patients.

Post operative period of this study seroma formation occurred 35% patients in onlay, 30% in sublay, 20% in component separation technique, 10% in laparoscopic surgery.

In our study, in onlay mesh repair patients had prolonged hospital stay because of seroma formation, wound dehiscence, wound infection and pain.70% of patients underwent onlay repair, discharged in the second week of post operative period. Mean period of onlay mesh repair 11.6 days.

Component separation technique patients had discharged, 1 patient in 1^{st} week, 8 in 2^{nd} week of post operative period. One patient had prolonged serous discharge and wound gapping. So the discharge was delayed upto 3^{rd} week.

Patients underwent laparoscopic procedure discharged in 1^{st} week of post operative period because of pelvic collection and pain. Sublay mesh repair patients discharged mostly in the end of 1^{st} week (65%).

In the follow up period, one patients had recurrence who underwent onlay mesh repair(5%). Molloy RG et al reported 8% of

recurrence in 45 months of follow up period in onlay mesh repair. In our study, recurrence rate was lesser. Vries experienced 23% in onlay mesh repair.

Overall, Onlay mesh repair had recurrence, wound infection, seroma formation and prolonged hospital stay. In early period of laparoscopic surgery, pelvic collection and pain are common which caused prolonged hospital stay. Component separation technique had chronic pain, prolonged hospital stay and wound infection.

Sublay mesh repair and laparoscopic repair had less and acceptable post operative complication, less hospital stay and no recurrence.

CONCLUSION

Open Sublay mesh repair and laparoscopic repair were the best method in our study compared to others. Middle aged female patients who underwent laparotomy with wound dehiscence having midline vertical incision had incisional hernia commonly.

PITFALL

- A large scale study is needed to reveal the actual situation regarding various etiology and to identify ideal procedure.
- We need more experience in laparoscopic surgery when comparing with other procedures.

BIBLIOGRAPHY

1. Patrick J Javid, David C Brooks; Hernias; Michael J Zinner, Staley W Ashley; "Maingot's abdominal operations, 11th edition" McGraw Hill, USA,2007, pg 103-104

2. I Katedra Chirugrgii Ogolnej CM UJ, Krakow "The history of treatment of groin hernia" Folia Med Cracov, 2008; 49(1-2); 57-74;

3. Lorelei J Grunwaldt, Steven D Schwaitzberg, David W Rattner "Is Laparoscopic Inguinal Hernia Repair an Operation of the Past?" jamcollsurg.2004.10.033

4. R. Van Hee "History of inguinal hernia repair." Jumalul de Chirurgie, Iasi, 2011, Vol. 7, Nr. 3[ISSN 1584 – 9341]

5. John E. Skandalakis, Gene I, Colbom, Thomas A. Weidman, Roger S. Foster, Jr., Andrew N. Kingsnorth, Lee J. Skandalakis "Shandalakis' Surgical Anatomy" Paschalidis medical publication, Greece, 2004.

6. Guy J. Maddern "Hernia repair open vs laparoscopic" Churchill livingstone, New York, 1997.

7. S. Bringman, J. Conze, D. Cuccurullo, J. Deprest, K. Junge “Hernia Repair: The Search For Ideal Meshes” Springer, Hernia (2010) 14:81-87

8. Saiz AA,, Willis IH, Paul DK, Sivina M. “Laparoscopic ventral hernia repair: A community hospital experience” Am surg 1996;62;336-8.

9. Rives J. Lardennois B, Pire J-CI, et al. “Les grandes eventrations. Importance du ‘volet abdominal’ et des troubles redspiratoires qui lui sont secondaires.” Chirurgie 1973 :99 : 547- 63.

10. Ramirez O, Ruas E, Dellon L. “Components separation method for closure of abdominal wall defects: an anatomical and clinical study” Plast Reconstr Surg 1990:86:519-26

11. Susan Standirg, GRAY’S Anatomy, “The Anatomical Basis of Clinical Practice” 39th Ed, 2008; section10 SYSTEMIC OVERVIEW Embryogenesis

12. Richard H. Turnage, MD et.al. SECTION X – Abdomen CHAPTER 43 – “Abdominal Wall, Umbilicus, Peritoneum,

Mesenteries, Omentum, and Retroperitoneum": Sabiston Textbook of Surgery, 18th ed.2007

13. John E. Skandalakis, et.al. Skandalakis' Surgical Anatomy

14. Souba, Wiley W; Fink, Mitchell P. Robert J. Fitzgibbons Jr. "ACS Surgery: Principles & Practice, 6th edition" Chapter 27 Open Hernia Repair pg 1-25

15. Parveen Bhatia "Indian association of gastrointestinal endo-surgeons, 2nd edition" Chapter 13, understanding of endoscopic anatomy of inguinal region.

16. Arthur I Gilbert, Michael F.Graham "Inguinal hernia: anatomy and management" http://surgery.medscape.com/medscape/surgery

17. Nyhus and Condon's "Hernia" edited by Fitzgibbons R.J. and Greenburg A.G., 5th ed, Philadelphia: Lippincott Williams & Wilkins;2002.

18. Birk DE, Mayne R: Localization of collagen types I, III and V during tendon development. Changes in collagen types I and III are correlated with changes in fibril diameter. Eur J Cell Biol 1997; 72: 352–61.

19. Junge K, Klinge U, Klosterhalfen B, Mertens PR, Rosch R, Schachtrupp A et al.: Influence of mesh materials on collagen deposition in a rat model. J Invest Surg 2002; 15: 319–28.

20. Stadelmann WK, Digenis AG, Tobin GR: Physiology and healing dynamics of chronic cutaneous wounds. Am J Surg 1998; 176 (2A Suppl.): 26S–38S.

21. Junge K, Klinge U, Rosch R, Mertens PR, Kirch J, Klosterhalfen B et al.: Decreased collagen type I/III ratio in patients with recurring hernia after implantation of alloplastic prostheses. Langenbecks Arch Surg 2004; 389: 17–22.

22. Hoer J, Lawong G, Klinge U, Schumpelick V: Factors influencing the development of incisional hernia. A retrospective study of 2,983 laparotomy patients over a period of 10 years. Chirurg 2002; 73: 474–80.

23. Ballas CB, Davidson JM: Delayed wound healing in aged rats is associated with increased collagen gel remodeling and contraction by skin fibroblasts, not with differences in apoptotic or myofibroblast cell populations.Wound Repair Regen 2001; 9: 223–37.

24. Gottrup F: Healing of incisional wounds in stomach and duodenum. The influence of aging. Acta Chir Scand 1981; 147: 363–9.

25. Eypasch E, Paul A: Bauchwandhernien: Epidemiologie, Ökonomie und chirurgische Technik – ein Überblick. Zentralbl Chir 1997; 122: 855–8.

26. Pollock AV, Greenall MJ, Evans M: Single-layer mass closure of major laparotomies by continuous suturing. J R Soc Med 1979; 72: 889–93.

27. da Silva AL, Petroianu A: Incisional hernias: factors influencing development. South Med J 1991; 84: 1500, 1504.

28. Santora TA, Roslyn JJ: Incisional hernia. Surg Clin North Am 1993; 73: 557–70.

29. Yahchouchy-Chouillard E, Aura T, Picone O, Etienne JC, Fingerhut A: Incisional hernias. Related risk factors. Dig Surg 2003; 20: 3–9.

30. Bucknall TE: The effect of local infection upon wound healing: an experimental study. Br J Surg 1980; 67: 851–5.

31. Hesselink V et al.: An evaluation of risk factors in incisional hernia recurrence. Surg Gyn Obstet 1993; 176: 228–34.

32. Derzie AJ, Silvestri F, Liriano E, Benotti P:Wound closure technique and acute wound complications in gastric surgery for morbid obesity: a prospective randomized trial. J Am Coll Surg 2000; 191: 238–43.

33. Sorensen LT, Hemmingsen UB, Kirkeby LT, Kallehave F, Jorgensen LN: Smoking is a risk factor for incisional hernia.Arch Surg 2005; 140: 119–23.

34. Sorensen LT, Friis E, Jorgensen T, Vennits B, Andersen BR, Rasmussen GI et al.: Smoking is a risk factor for recurrence of groin hernia.World J Surg 2002; 26: 397–400.

35. Junge K, Klinge U, Klosterhalfen B, Rosch R, Stumpf M, Schumpelick V: Review of wound healing with reference to an unrepairable abdominal hernia. Eur J Surg 2002; 168: 67–73.

36. Girotto JA, Malaisrie SC, Bulkely G, Manson PN: Recurrent ventral herniation in Ehlers-Danlos syndrome. Plast Reconstr Surg 2000; 106: 1520–6.

37. Liem MS, van der GY, Beemer FA, van Vroonhoven TJ: Increased risk for inguinal hernia in patients with Ehlers-Danlos syndrome. Surgery 1997; 122: 114–5.

38. Rowe DW, Shapiro JR, Poirier M, Schlesinger S: Diminished type I collagen synthesis and reduced alpha 1(I) collagen messenger RNA in cultured fibroblasts from patients with dominantly inherited (type I) osteogenesis imperfecta.J Clin Invest 1985; 76: 604–11.

39. Uden A, Lindhagen T: Inguinal hernia in patients with congenital dislocation of the hip. A sign of general connective tissue disorder. Acta Orthop Scand 1988; 59: 667–8.

40. Korenkov M, et al. “Biomechanical and morphological types of the linea alba and its possible role in the pathogenesis of midline incisional hernia”. Eur J Surg 2001; 167(12):909–14.

41. Millikan KW. “Incisional hernia repair”. Surg Clin North Am 2003; 83:1223–34.

42. Carlson MA, Ludwig KA, Condon RE. “Ventral hernia and othercomplications of 1,000 midline laparotomies”. South Med J 1995; 88(4):450–

43. Cassar K, Munro A. “Surgical treatment of incisional hernia”. Br J Surg 2002;89:534–45

44. Wantz GE. Incisional hernia: the problem and the cure. JAmColl Surg 1999;188(4):433–47.

45. Core GB, Grotting JC. Reoperative surgery of the abdominal wall. In: Grotting JC, editor. Aesthetic and reconstructive plastic surgery. St Louis (MO): Quality Medical Publishing, Incorporated; 1995. p. 1327–75.

46. Rohrich RJ, Lowe JB, Baty JD, et al. An algorithm for abdominal wall reconstruction.Plast Reconstr Surg 2000;105(1):202–16.

47. DiBello JN Jr, Moore JH Jr. Sliding myofascial flap of rectus abdominus muscles for the closure of recurrent ventral hernias. Plast Reconstr Surg 1996;98(3):464–9

48. Nguyen V, Shestak KC. Separation of anatomic components method of abdominal wall reconstruction: clinical outcome analysis and an update of surgical modifications using the technique. Clin Plast Surg 2006;33:247–57.

49. Luijendijk RW, Hop WC, Van den Tol MP, et al. A comparison of suture repair with mesh repair for incisional hernia. N Engl J Med 2000;343(6):392–8.

50. Burger JW, Luijendijk RW, Hop WC, et al. Long term follow up of a randomized controlled trial of suture versus mesh repair of incisonal hernia. Ann Surg 2004;240(4):578–83 [discussion: 583–5].

51. Anthony T, Bergen PC, Kim LT. Factors affecting recurrence following incisional herniorrhaphy.World J Surg 2000;24(1):95–101.

52. Read RC, Yoder G. Recent trends in management of incisional herniation. Arch Surg 1989;124:485–8.

53. Millikan KW. Incisional hernia repair. Surg Clin North Am 2003;83:1223-34.

54. Korenkov M, Paul A, Sauerland S, et al. Classification and surgical treatment: results of an experts' meeting. Langenbecks Arch Surg 2001;386:65–73.

55. Leber GE, Garb JL, Alexander AJ, et al. Long term complications associated with prosthetic repair of incisional hernias. Arch Surg 1998;133(4):378–82.

56. Grevious MA, Cohen M, Jean-Pierre F, et al. The use of prosthetics in abdominal wall reconstruction. Clin Plast Surg 2006;33:181–97.

57. Satyaprasad C. Burjonrappa, Samuel Cemaj, Robert J. Fitzgbbons Jr, Charles J. Yeo “Shackelford’s Surgery of the Alimentary Tract, 6th Edition” Elsevier, Philadelphia, 2007, chapter 45.

58. Klinge U, Klosterhalfen B, Conze J, et al. Modified mesh for hernia repair that is adapted to the physiology of the abdominal wall. Eur J Surg 1998;164(12):951–60.

59. Klinge U, Conze B, Klosterhalfen B, et al. Changes in abdominal wall mechanics after mesh implantation: experimental changes in mesh stability. Langenbecks Arch Chir 1996;381(6):323–32.

60. Temudom T, Siadati M, Sarr MG. Repair of complex giant or recurrent ventral hernias by using tension-free intraparietal

prosthetic mesh (Stoppa technique): lessons learned from our initial experience (fifty patients). Surgery 1996;120:738–43.

61. Gillion JF, Begin GF, Marecos C, et al. Expanded polytetrafluoroethylene patches used in the intraperitoneal or extraperitoneal position for repair on incisional hernias of the anterolateral abdominal wall. Am J Surg 1997;174:16–9.

62. Millikan KW, Baptista M, Amin B, et al. Intraperitoneal underlay ventral hernia repair utilizing bilayer ePTFE and polypropylene mesh. Am Surg 2003;69:258–63.

63. Carbajo MA, Martin del Olmo JC, Blanco JI, et al. Laparoscopic treatment versus open surgery in the solution of major incisional and abdominal wall hernias with mesh. Surg Endosc 1999;13:250–2.

64. Ramshaw BJ, Schwab J, Mason EM, et al. Comparison of laparoscopic and open ventral herniorrhaphy. Am Surg 1999;65:827–31.

65. Park A, Burch DW, Lovrics P. Laparoscopic and open incisional hernioplasty. Surg Endosc 1997;11:32–5.

66. Voeller GR, Ramshaw B, Park AE, et al. Incisional hernia. J Am Coll Surg 1999;189(6):635–7.

67. Lowe JB. Updated algorithm for abdominal wall reconstruction. Clin Plast Surg 2006;33:225–40.

68. Mathes SJ, Nahai F. Clinical application of muscle and musculocutaneous flaps. St Louis(MO): Mosby; 1982.

69. Mathes SJ, Nahai F. Reconstructive surgery: principles, anatomy, and technique. New York: Churchill Livingstone; 1997.

70. Ohtsuka H, Ochi K, Seike H. Reconstruction of a large lateral abdominal wall defect with an iliolumbar bipedicled flap. Br J Plast Surg 1984;37(3):327–9.

71. Parkash S, Palepu J. Rectus abdominus myocutaneous flap: clinical experience with ipsilateral and contralateral flaps. Br J Surg 1983;70(2):68–70.

72. Mathes SJ, Bostwick J III. A rectus abdominus myocutaneous flap to reconstruct abdominal wall defects. Br J Plast Surg 1977;30(4):282–3.

73. DeFranzo AJ, Kingman GJ, Sterchi JM, et al. Rectus turnover flaps for the reconstruction of large midline abdominal wall defects. Ann Plast Surg 1996;37(1):18–23.

74. Spear SL, Walker RK. The external oblique flap for reconstruction of the rectus sheath. Plast Reconstr Surg 1992;90(4):608–13.

75. Disa JJ, Goldberg NH, Carlton JM, et al. Restoring abdominal wall integrity in contaminated tissue deficient wounds using autologous fascia grafts. Plast Reconstr Surg 1988; 101(4): 979–86.

76. Williams JK, Carlson GW, deChalain T, et al. Role of tensor fascia lata in abdominal wall reconstruction. Plast Reconstr Surg 1998;101(3):802–5.

77. Kimata Y, UchiyamaK, Sekido M, et al. Anterolateral thigh flap for abdominal wall reconstruction.Plast Reconstr Surg 1999;103(4):1191–7.

78. Sasaki K, Nozaki M, Nakazawa H, et al. Reconstruction of a large abdominal wall defect using combined free tensor fascia

latae musculocutaneous flap and anterolateral thigh flap. Plast Reconstr Surg 1998;102(6):2244–52.

79. Caulfield WH, Curtsinger L, Powell G. Donor leg morbidity after pedicled rectus femoris muscle flap transfer for abdominal and pelvic reconstruction. Ann Plast Surg 1994;32(4): 377–982.

80. McCraw JB, Dibbell DG, Carraway JH. Clinical definition of independent myocutaneous vascular territories. Plast Recostr 1977;60(3):341–52.

81. Ninkovic M, Kronberger P, Harpf C. Free innervated latissimus dorsi muscle for reconstruction of full-thickness abdominal wall defects. Plast Reconstr Surg 1998;101(4):971–8.

82. Bostwick J 3rd, Vasconez LO, Nahai F, et al. Sixty latissimus dorsi flaps. Plast Reconstr Surg 1979;63(1):31–41.

83. Venugopalan S. Repair of midline abdominal incisional hernia by gracilis muscle transfer. Br J Plast Surg 1980;33(1):43–5.

84. Jacobsen WM, Petty PM, Bite U, et al. Massive abdominal wall hernia reconstruction with expanded external/internal oblique transversalis fascia. Plast Reconstr Surg 1997;100(2):326–35.

85. Hobar PC, Rohrich RJ, Byrd HS. Abdominal-wall reconstruction with expanded musculofascial tissue in a posttraumatic defect. Plast Reconstr Surg 1994; 94(2): 379–83.

PROFORMA

Name	:	DOA	:
Age	:	DOS	:
Sex	:	DOD	:
Occupation	:	IP.NO	:
Address	:		
DIAGNOSIS	:	PROCEDURE	

Clinical Presentation:

Diffuse bulge only

Pain

Obstructive symptoms

Chronic cough / constipation / Dysuria

Any other relevant complaints.

PAST HISTORY

Trauma to anterior abdominal wall - bull gore / stab injury

Complication of previous surgery

No. of surgery

Details of operation - emergency / elective

Type of incision Wound

Infection Disruption of wound Post operative abdominal distention

Post operative cough/Swelling / Hiccough

Presence and duration of drains

H/o DM/malnutrition /anaemia / hypoproteinemia / Jaundice /malignancy/others

PERSONAL HISTORY

Smoking/Alcohol use

Menstrual history in women.

PHYSICAL EXAMINATION

GENERAL

Clinical survey – obese / not

Anaemia, jaundice Edema

Lymph nodes status.

VITALS

Temperature RR

Pulse BP

SYSTEMIC EXAMINATION

- Ex of RS / Abdomen / Other system

LOCAL EXAMINATION

Inspection – swellin- position and extent, size, shape,

-Visible peristalsis,

-Skin over swelling,

-Signs of inflammation,

- Scars of previous surgery,

-Impulse on Coughing Reducibility

PALPATION

- Position & extent
- Warmth
- Consistency – rough granular elastic
- tense and tender(Strangulated hernia)
- Reducibility

Defects in anterior abdominal wall – position, size

Percussion – Resonant / dull

Auscultation – Bowel Sound heard or not

ESTIMATION OF THE TONE OF ABDOMINAL MUSCLES

P/R & P/V EXAMINATION.

Investigations:

Blood Hb

Blood – Urea, Sugar, Serum - Creatinine

Urine – Albumin., Sugar, Deposit

ECG

X-Ray chest

USG – Abdomen and Pelvis – to rule out any associated pathology

CT / MRI

TYPE OF SURGERY PERFORMED –

Emergency Or Elective

Anaesthesia SA/Epidural/GA

Post operative progress

Advice given - Diet

Treatment to be carried out

Change of occupation if any

Follow up - C ondition

Bowel habits

Abdominal pain

Recurrence

Any complication

PATIENT CONSENT FORM

STUDY TITLE : A CLINICAL STUDY ON INCISIONAL HERNIA

STUDY CENTRE : Department of General surgery, GMKMCH Salem

PARTICIPANT NAME : AGE : SEX:

I.D. NO :

I confirm that I have understood the purpose of surgical procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during surgical and post surgical procedure. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study for various surgical procedures and their outcomes.

Time :

Date : signature / thumb impression of patient

Place :

Patient'name:

Signature of the investigator: _____

Name of the investigator : _____

xx

THE KEY TO MASTER CHART

M-male

F-female

LSCS-lower segmental caesarian section

TI-transverse incision

PI-pfannensteal incision

MVI-Median vertical incision

PMI-Paramedian incision

PSI-Port site incision

SCI-Subcostal incision

LI-Lumber incision

WI-Wound infection

C- Cough

WD-Wound Discharge

US-Urinary symptoms

R-Recurrence

Cs-constipation

m-Month

y-years

ON-Onlay mesh repair

SUB-Sublay mesh repair

COMP-component separation technique

LAP-laparoscopic technique

P-pain

B-bleeding

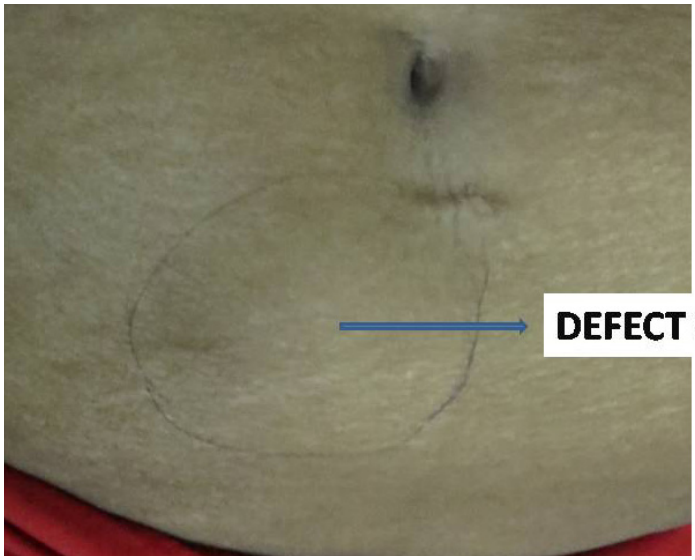
F-fever

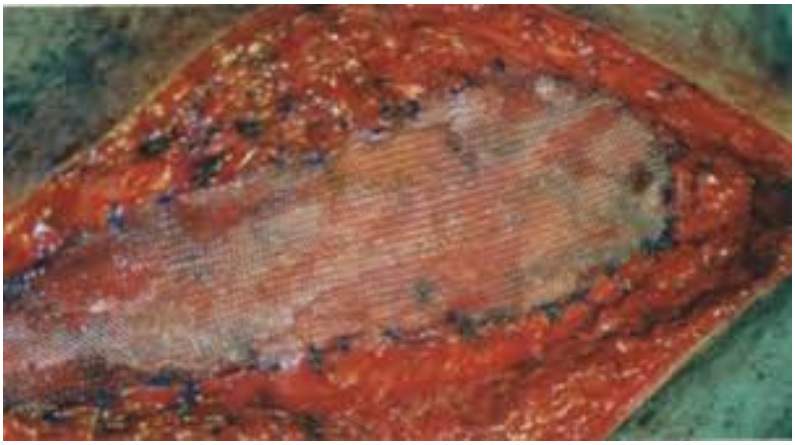
PC-pelvic collection

MI-mesh infection

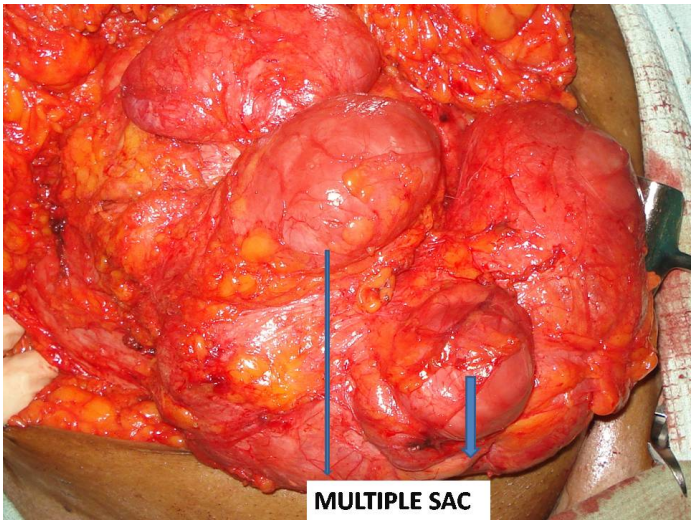
FN-flap necrosis

NC-no compliant


DEFECT SITE



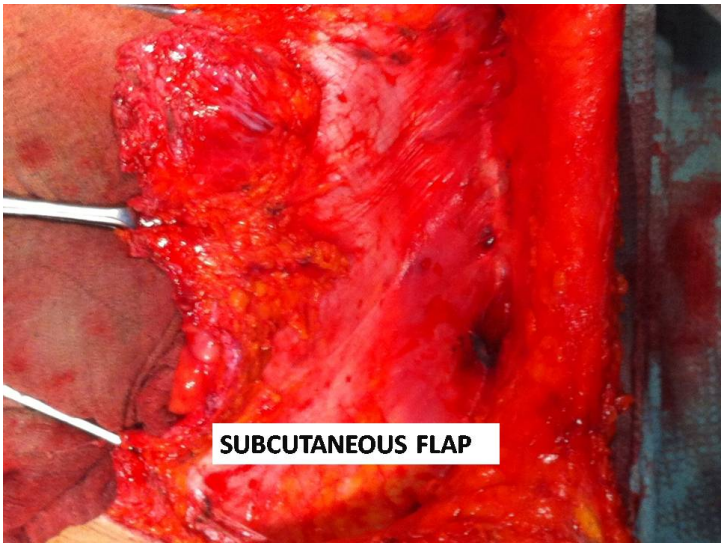
HUGE INCISIONAL HERNIA

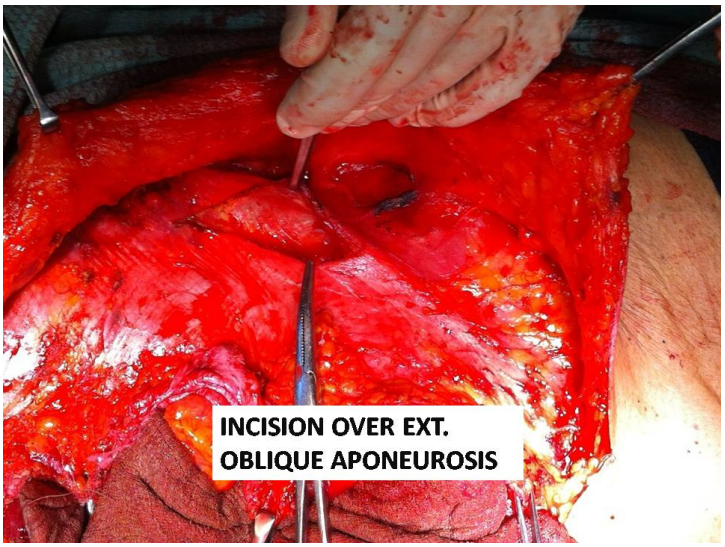


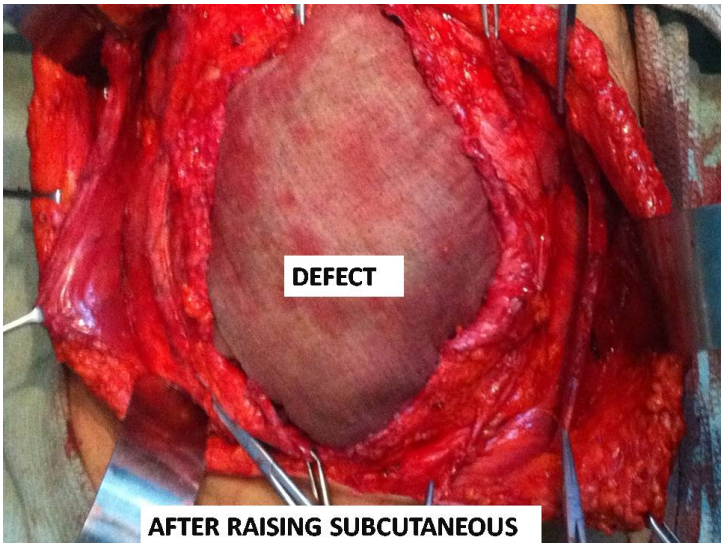
MULTIPLE SAC

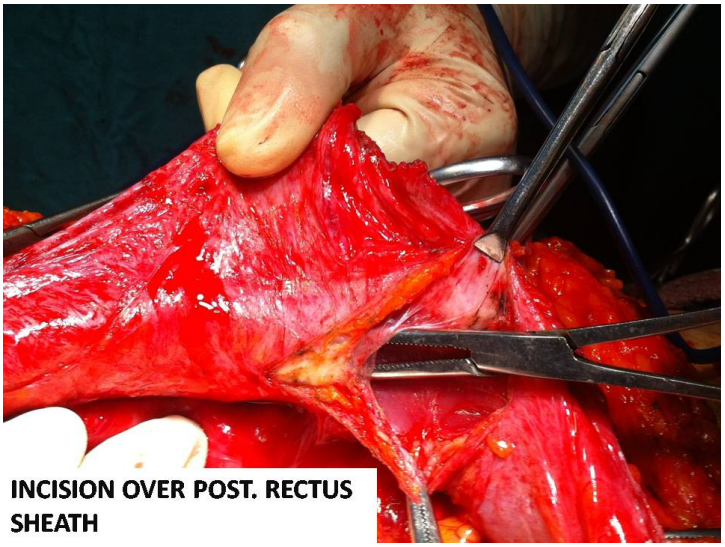
ABDOMINOPLAST

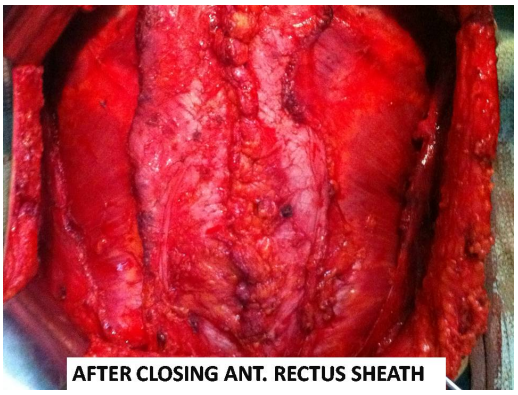

HUGE INCISIONAL HERNIA
WITH SCAR


SUBCUTANEOUS FLAP

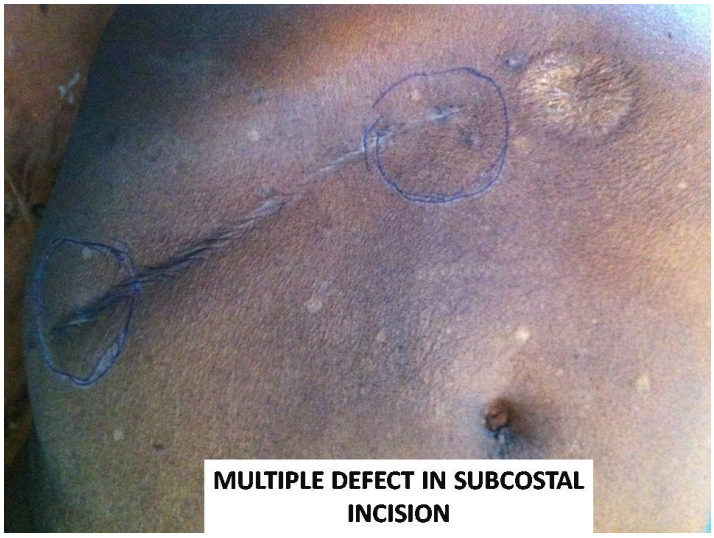

INCISION OVER EXT.
OBLIQUE APONEUROSIS

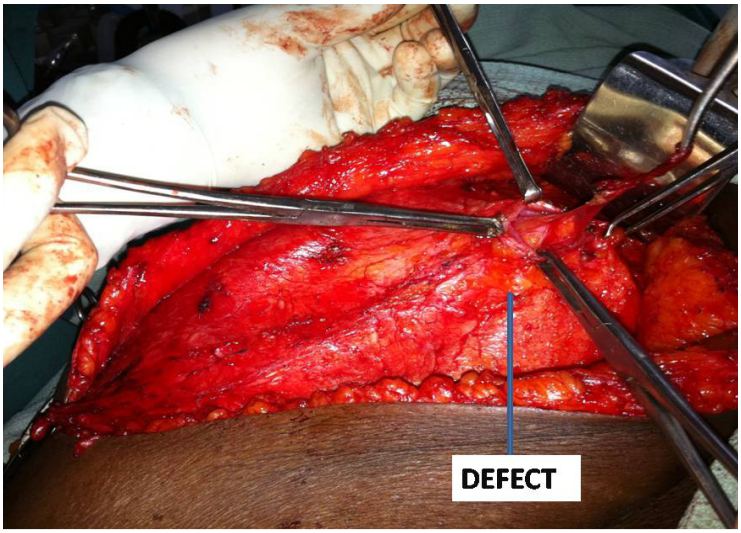

DEFECT
AFTER RAISING SUBCUTANEOUS

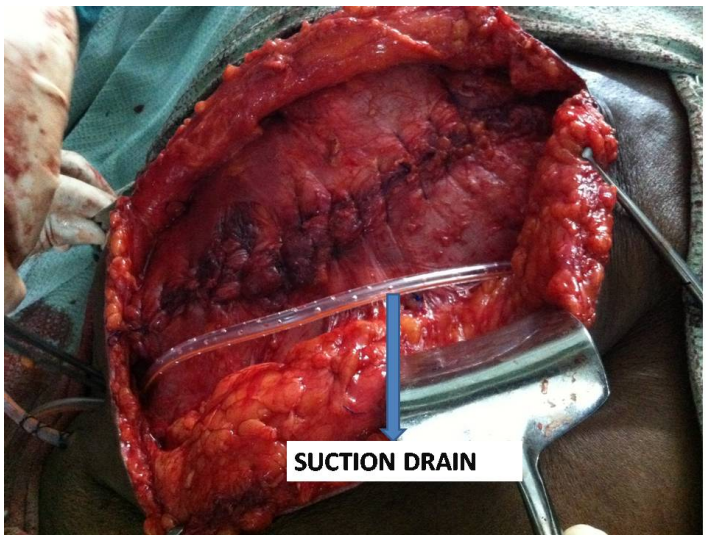

INCISION OVER POST. RECTUS SHEATH


AFTER CLOSING ANT. RECTUS SHEATH

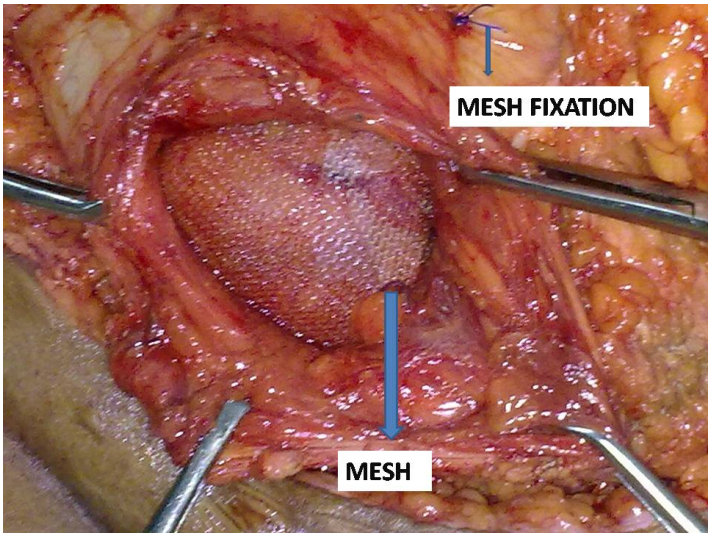

HUGE INCISIONAL HERNIA AFTER SURGERY

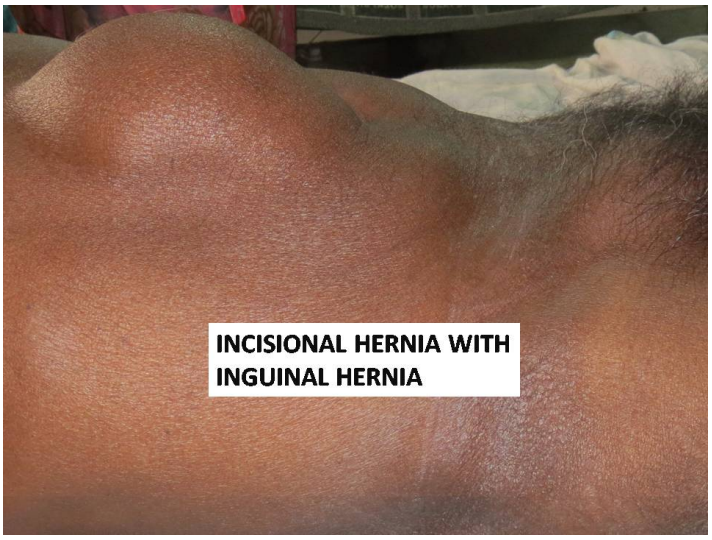

MULTIPLE DEFECT IN SUBCOSTAL
INCISION


DEFECT

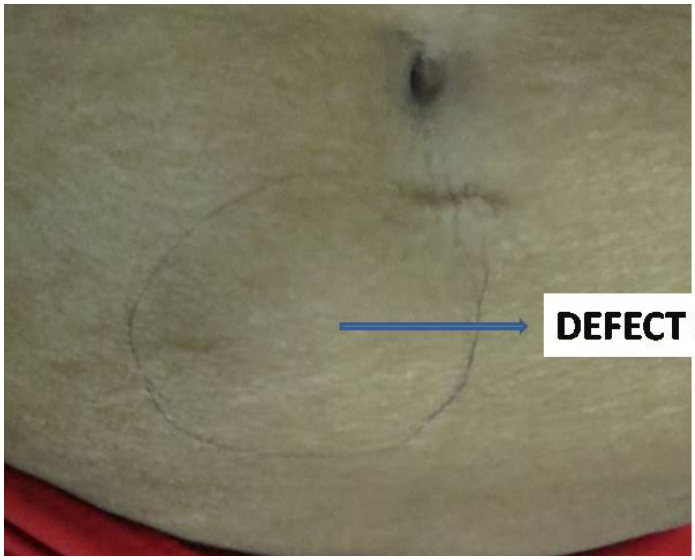

SUCTION DRAIN

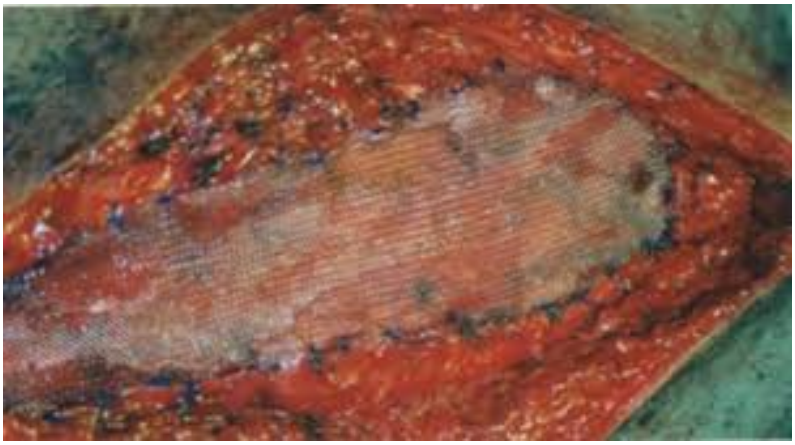

MULTIPLE DEFECT AFTER
EMERGENCY LAPAROTOMY


MESH FIXATION
MESH

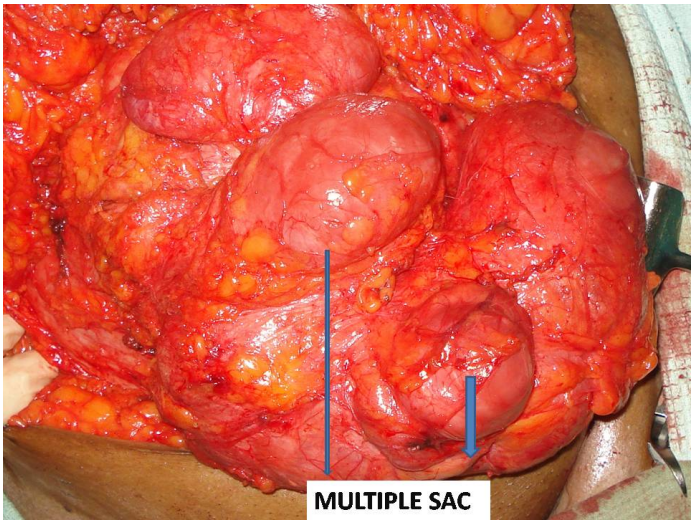

INCISIONAL HERNIA WITH
INGUINAL HERNIA


RECURRENT INCISIONAL HERNIA
WITH SCAR


DEFECT SITE



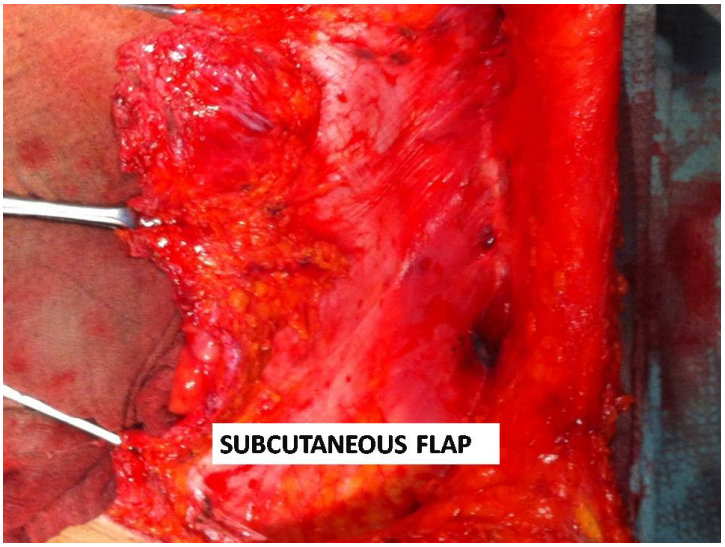
HUGE INCISIONAL HERNIA

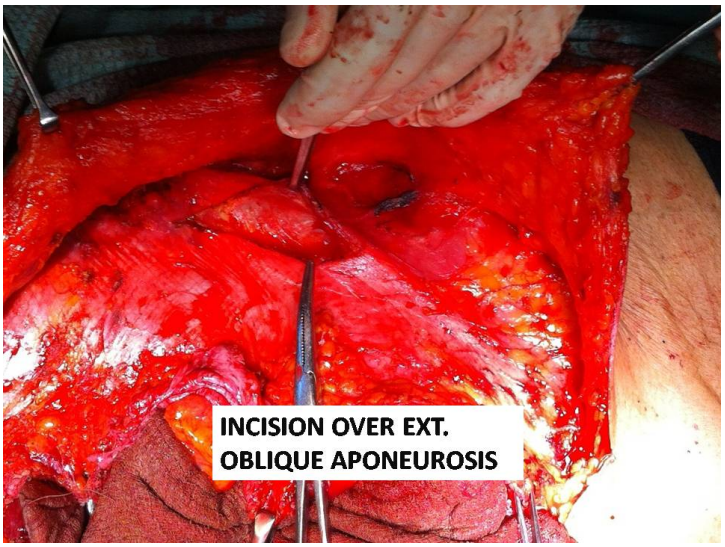


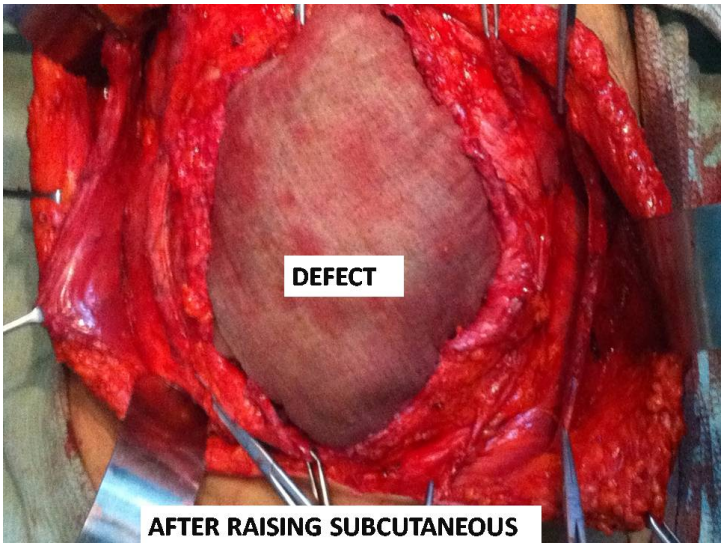
MULTIPLE SAC

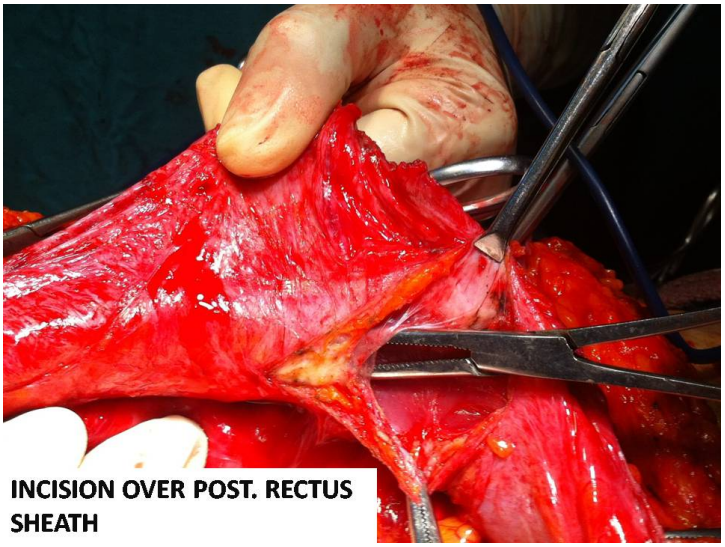
ABDOMINOPLAST

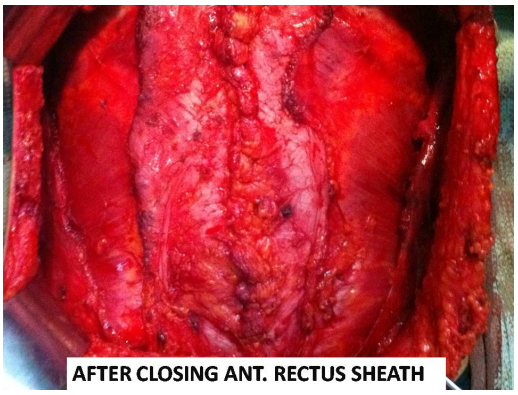

HUGE INCISIONAL HERNIA
WITH SCAR


SUBCUTANEOUS FLAP

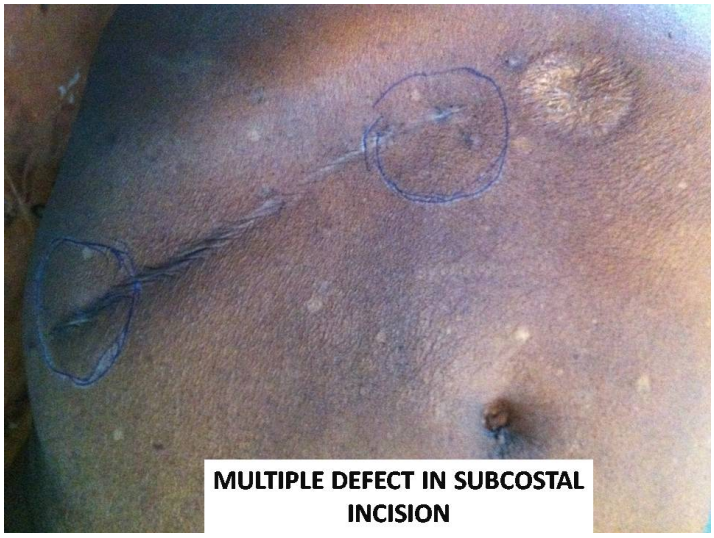

INCISION OVER EXT.
OBLIQUE APONEUROSIS

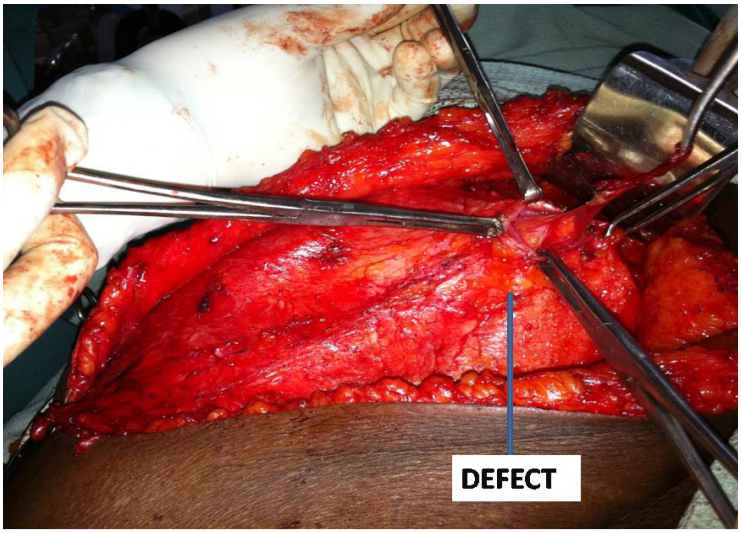

DEFECT
AFTER RAISING SUBCUTANEOUS

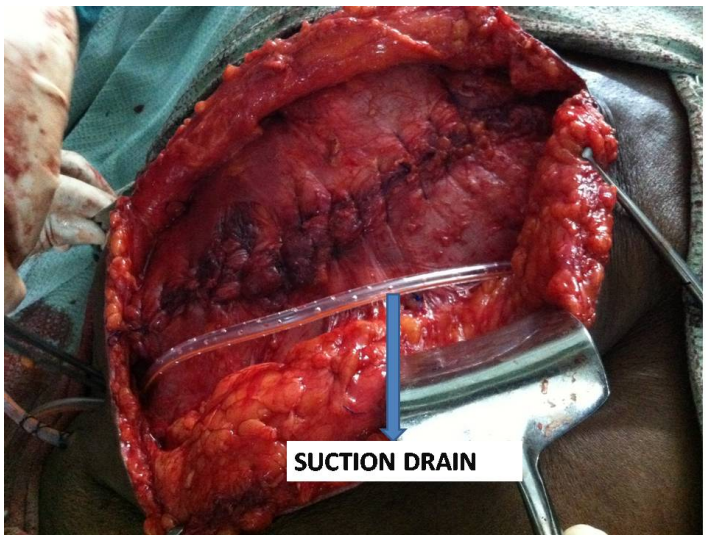

INCISION OVER POST. RECTUS SHEATH


AFTER CLOSING ANT. RECTUS SHEATH

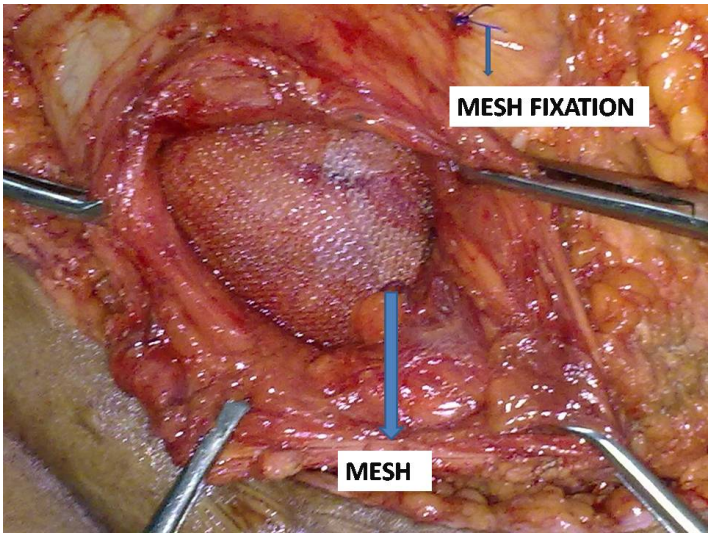

HUGE INCISIONAL HERNIA AFTER SURGERY

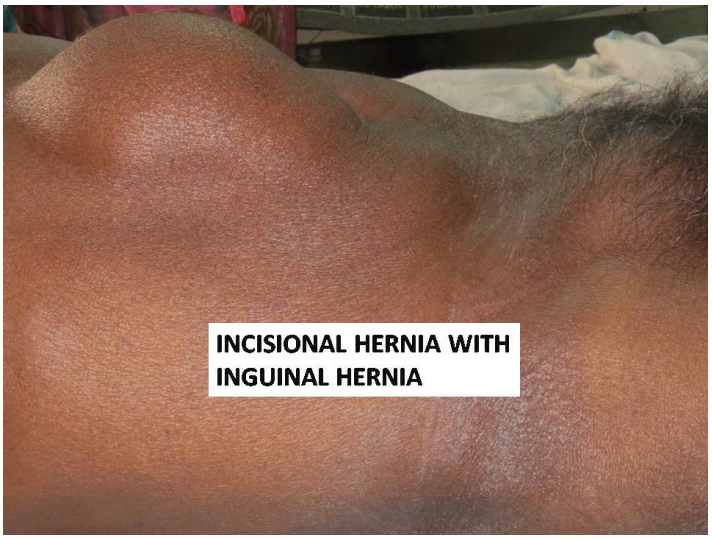

MULTIPLE DEFECT IN SUBCOSTAL
INCISION


DEFECT


SUCTION DRAIN


MULTIPLE DEFECT AFTER
EMERGENCY LAPAROTOMY


MESH FIXATION
MESH


INCISIONAL HERNIA WITH
INGUINAL HERNIA


RECURRENT INCISIONAL HERNIA
WITH SCAR